

# SUPPLEMENT

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### Section II.—Surgery.

(Continued.)

#### TECHNIQUE OF OPERATION FOR EXOPHTHALMIC GOITRE.

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THE patient is placed on the table with a pillow under the shoulders to extend the neck fully and to bring into prominence the thyroid gland. After the skin-towels are placed in position, the final preparation of the skin is made. The incision usually made is that known as the "collar incision." This is made transversely across the most prominent part of the gland, conforming as far as possible to or parallel with the natural creases of the neck and includes skin, subcutaneous fascia and platysma. The incision will vary in length and may extend laterally as far as the external jugular veins. The platysma muscle may not be seen as a separate structure and it is not necessary to identify it as such. The skin and subcutaneous fascia are reflected upwards as far as the thyroid cartilage and downwards to the sternum. The anterior jugular veins are now seen on either side of the mid-line and may be ligated and divided if necessary. Sometimes one or more venous trunks run transversely from one anterior jugular vein to the other; and these, if present, must be cut and tied.

The next step is a vertical incision in the mid-line through the deep fascia and the sterno-hyoid and sterno-thyroid muscles are exposed. Some surgeons divide the deep fascia and muscles transversely. These muscles are separated and retracted well outwards on the side to be operated on and do not require section, except in very large goitres. If the muscles are divided, long forceps are placed on the cut ends of each to identify them for suturing towards the end of the operation. The loose areolar tissue covering the thyroid gland is now gently separated from the anterior part of the gland from within outwards and as this is being done, its free edge caught in a forceps may be utilized to lift up and deliver the thyroid gland while an assistant retracts the sterno-hyoid and sterno-thyroid muscles. Resistance to this manoeuvre is often found at the superior pole and this portion is

first freed from its fascial attachments. The superior thyroid vessels are now ligatured and divided. By lifting the upper pole of the gland gently with the finger and working downwards, the middle thyroid vein is seen. This is ligatured and divided close to the gland. We are now able to deal with the true capsule of the thyroid, a very important part of the operation. After the division of the middle thyroid vein the capsule is incised along the lateral border. This allows the separation of the posterior part of the capsule from the thyroid gland and prevents the removal of the parathyroids and injury to the recurrent laryngeal nerve. As the parathyroids are situated behind the gland and in close relationship with its capsule, their preservation may depend on non-interference with the posterior part of the capsule. As the incision into the capsule is carried downwards, the external branch of the inferior thyroid artery is ligatured and then the inferior thyroid vein. The gland being steadied by one hand, is gently pulled towards the mid-line while the capsule is being stripped off its posterior surface with gauze swabs. The internal branch of the inferior thyroid artery is encountered and tied and one lobe is ready for removal. The isthmus is gently separated from the anterior surface of the trachea and at its junction with the intact lobe is clamped and divided. The stump is ligatured and cauterized. In dealing with the other lobe at the same time or subsequently the same steps are taken, except that either the upper or lower pole is not removed. As a rule it is better to remove the upper portion. After tying the superior vessels and middle thyroid vein, a V-shaped incision is made through the gland below the middle thyroid vein, the apex of the V pointing downwards, to allow approximation of the cut surfaces by suture. Hæmorrhage occurs freely and is controlled by ligature and suture. Roughly about two-thirds of the lobe is removed, but I think it important to leave rather less than what one considers to be the size of the ordinary gland. As to the expediency of the bilateral operation at one sitting, more will be said later. After all the bleeding has been arrested, a small drainage tube is put into the cavity and brought out through a stab wound below the incision. If the sterno-hyoid and sterno-thyroid muscles have been divided, their edges are brought together and sutured with catgut. Then the deep fascia is sutured in the mid-line. The subcutaneous tissue with the platysma is approximated and lastly the skin. The use of the subcuticular suture for the skin seems to be the best and its good immediate result, with the absence of unsightly needle-

puncture scars, more than justifies the extra time and labour expended on its performance. To get a little wound suppuration in one case out of nearly two hundred operations makes one wish for similar good fortune in other surgical branches.

The technique described above is for the operation known as lobectomy, that is, removal of one lobe or of one lobe and isthmus. Subtotal thyroidectomy, where both lobes and isthmus are removed, leaving only portion of the posterior surface of the gland and capsule, is gaining favour and is advocated by Mayo, Crile and Hertzler. The advocates of the latter operation claim better immediate and more permanent results as more gland is removed and emphasize the importance of non-interference with the parathyroids and the recurrent laryngeal nerve.

In reply to these claims, we may say that the immediate results of lobectomy are usually excellent and do not call for the exhibition of thyroid medication and, if the operation is to include the second lobe, as much gland tissue may be taken as by a subtotal thyroidectomy. I have never performed the latter operation and have never seen a patient who has undergone it, so can offer no criticism of its results. On the only occasion when I removed more than one lobe at one operation the results was fatal, so am not disposed to repeat it.

In second operations patients show a far smaller reaction than in their first and their disinclination for further surgery is more than compensated by the decreased risk.

By leaving the capsule which covers the posterior surface of the thyroid gland as described above, there is not much risk to the parathyroids and recurrent laryngeal nerve. There has been no case of tetany in my series and only after two operations was there permanent paralysis of the nerve and this paralysis followed in patients in whom the gland penetrated deeply between the trachea and oesophagus. As it was necessary to remove the whole of the lobe in these patients to relieve the pressure on the trachea and oesophagus, the subtotal operation would not have been suitable.

The cosmetic results of lobectomy are good except in cases where hypertrophy of the remaining lobe subsequently occurs. In this event a second operation is usually indicated and, if performed, it is advisable to remove the upper portion. The lower lobe being more deeply situated, will not be prominent and its subsequent enlargement, if moderate, will not alter the natural contour of the neck.

#### Results of Operations.

Number of thyroidectomies .. .. .	103
Immediate mortality .. .. .	3
Death from other causes .. .. .	3
First operations .. .. .	93
Second operations .. .. .	10
Remaining well after first operation .. .	31
Remaining well after second operation ..	9
Doubtful results .. .. .	15
Requiring second operation .. .. .	14
Requiring third operation .. .. .	1
Unknown results .. .. .	20

In three cases local anaesthesia was employed and in the remainder ether administered by the open method. A hypodermic injection of 0.01 gramme (one-sixth of a grain) of morphine with 0.0005 gramme (1-120 grain) of atropine was given three-quarters of an hour beforehand and none of the deaths could be attributed to the ether. All the fatal results were in patients with a long history extending over three years and were after first operations, two occurring within a few hours due to shock; the third patient died of hyperthyroidism about sixteen hours after operation. Of the patients traceable three have died later, one of diabetic coma, one of septic peritonitis following appendicitis and one of mammary scirrhus.

Of the thirty-one patients remaining well after first operation, ten have been operated on less than two years and of the remaining twenty-one nineteen gave a history of six months' duration or less. Fifteen cases are doubtful, that is there is slight hypertrophy of the remaining lobe and a pulse rate varies from 90 to 100 per minute. These patients say they feel better and stronger, but they have not increased in weight.

Fourteen patients require a second operation, having a pulse rate over 100 per minute, hypertrophy of the remaining lobe and some loss of weight and strength.

Of the ten patients subjected to a second operation only one requires a third and nine remain well. Since the second operation four patients have remained well for more than five years, two for four years and three for two years.

The patient requiring a third operation had recurrence of symptoms within twelve months of the second operation.

Unknown results amount to twenty. This is very unsatisfactory from a statistical point of view, but is readily intelligible to anyone knowing the nomadic habits of many Australians.

Excluding the ten patients operated on less than two years ago, we might say that twenty-one out of eighty-three patients are apparently cured by one operation, while fourteen do and fifteen may require a second one. Of those who have undergone a second operation, three patients were not under my care on the first occasion. Nine out of ten patients remain well after the second operation and one shows the necessity for a third.

It is not uncommon to hear that surgery does not cure exophthalmic goitre—an opinion not confined to the lay public. Without claiming unvarying success it is not unreasonable to state that a large percentage of the so-called failures are incomplete cures, as it is often difficult to persuade the patient that a further operation is necessary and advisable. It is wiser to be perfectly frank and to give a warning that one operation may not be sufficient and that regular examinations afterwards will be necessary. If a strong appeal is made to complete the operation at one sitting, it is very important to convince the patient that the main object is to minimize the risk. My experience of second operations, though but small, is that there is much less reaction, quicker convalescence and more permanent results. Time will show whether more than 10% will need a third operation, but I feel confident that better results than this will be obtained.

THE EFFECT OF TREATMENT IN HYPERTHYROIDISM CONTROLLED BY OBSERVATIONS OF THE BASAL METABOLIC RATE.

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MUCH has been written of recent years concerning the basal metabolism in exophthalmic goitre. In 1916 Du Bois reviewed the literature (1). Means and Aub (2) discussed the effect of treatment on this disease. Boothby gives further references in connexion with this subject in a paper (3) entitled "The Basal Metabolic rate in hyperthyroidism."

This communication is based on observations made during the last two years upon seventeen patients suffering from hyperthyroidism. In it are described the immediate effects of different forms of treatment. It is intended to discuss the later progress of the cases in a further report.

"Hyperthyroidism" is here used to include both "exophthalmic" goitre and "toxic adenoma" of the thyroid gland, as described by Plummer. Briefly in exophthalmic goitre the average age of onset of symptoms is twenty-eight years; there is a general enlargement of the thyroid gland and exophthalmos and the patient usually seeks medical aid within one year. Adenoma of the thyroid gland appears at about twenty-two years of age. Toxic symptoms do not supervene until approximately thirty-six years of age and therefore the sufferer may not come for treatment until this time. The thyroid shows one or more rounded swellings in its structure. There is practically never any exophthalmos.

Whilst a careful record has been kept of the general progress in each case, more particular attention has been paid to the determination from time to time of the basal metabolic rate.

Some of the earlier readings were obtained by the use of the Douglas bag. Later a modified Zuntz-Geppert method was used, the patient expiring directly through a meter. A sample of the expired air was automatically drawn off, continuously throughout the estimation. In most cases duplicate analyses of this sample were made.

Preliminary "dummy" tests were carried out in all cases, to eliminate as far as possible the psychic factor. The actual observations were taken whilst the subject rested quietly in bed before breakfast twelve to fourteen hours after the previous meal. The average duration of the tests was sixteen minutes and ranged between ten and twenty minutes.

For convenience, the cases are grouped as follows:

Group I.—Those treated by half-hearted medical measures, such as the hospital out-patient department treatment;

Group II.—Those receiving careful medical treatment, with prolonged rest in bed;

Group III.—Those treated by exposure to X-rays;

Group IV.—Those subjected to operation.

Group I.

Group I. includes two patients with exophthalmic goitre.

Case 1.—A female, unmarried, *aetatis* twenty-seven years, had suffered for five years from a moderate degree

of hyperthyroidism with exophthalmos, enlargement of the thyroid gland, tremor and tachycardia. In November, 1922, the basal metabolic rate was + 25%. Nine months later she had lost three kilograms of body weight and the basal metabolic rate was + 32%.

Case 2.—A male, *aetatis* thirty-two years, came under observation four years after the onset of the classical symptoms of exophthalmic goitre. The basal metabolic rate was + 40%. After one year spent in attempting to carry out his occupation as a tinsmith, he had lost weight (three kilograms) and the basal metabolic rate was + 54%.

These results support the commonly accepted view that, treated inadequately, sufferers from "hyperthyroidism" do not tend to improve, at least over a period of some years. During this period all of the tissues of the body and more especially the cardiac musculature must suffer untold damage as a result of never ceasing overactivity.

Group II.

Group II. includes seven patients with exophthalmic goitre treated by rest in bed or complete cessation of exertion, over periods ranging from two and a half to twelve months.

Case 3.—A female, *aetatis* forty-five years, married, was admitted into hospital two years after the onset of symptoms. She had practically all the classical signs of exophthalmic goitre, with definite damage to the heart muscle.

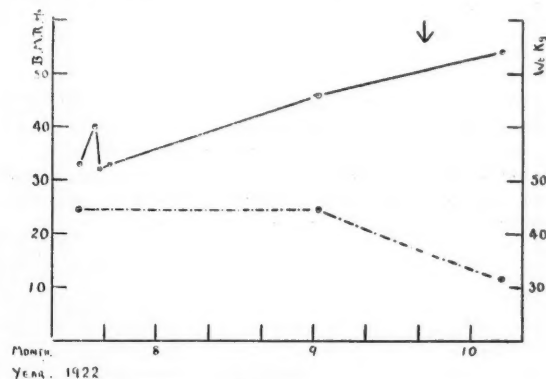


FIGURE I.

(Case 3.) Showing the effect of rest in bed. The arrow indicates the date of ligature of the superior thyroid arteries. Death on December 16, 1922. The continuous line indicates the basal metabolic rate. The interrupted line indicates the body weight.

Rest failed to improve her condition, the basal metabolic rate continuing to rise during her stay in hospital. After two months the superior thyroid arteries were ligated. One more reading of the basal metabolic rate was obtained, after which the woman was too ill to allow of further tests. She died two months later (see Figure I.).

Case 4.—A male, *aetatis* thirty-five years, had exophthalmic goitre and *diabetes mellitus*. When first seen five months after the onset of symptoms his basal metabolic rate was + 52%. He presented at the same time signs of *diabetes mellitus*, with the typical blood sugar curve after administration of glucose. After seven months spent resting at home, he had lost six kilograms of body weight and the basal metabolic rate was + 17%. The symptoms of hyperthyroidism appeared to be much less severe,

whilst those attributable to diabetes had become more severe. He has since died.

Three patients were subjected to operation when it became evident that rest would not effect a cure.

Case 5.—A female, *aetatis* thirty-six years, married, had exophthalmic goitre. When first seen she had been ill for one year, the last five months of which she had spent in bed. At the end of this period her basal metabolic rate

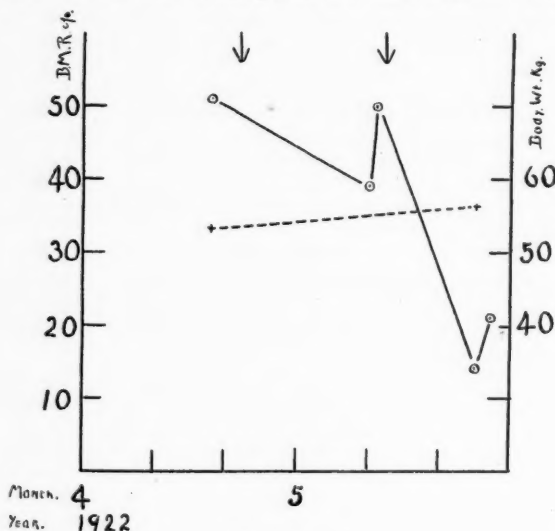


FIGURE II.

(Case 5.) Arrows indicate dates of first and second operations. The continuous line indicates the basal metabolic rate. The interrupted line indicates the body weight.

was +48%. Partial thyroidectomy was then performed. Her further progress is discussed under Group IV. (see Figure II.).

Case 6.—A male, *aetatis* twenty-two years, had developed eight months prior to his admission into hospital all the classical symptoms of exophthalmic goitre. The basal metabolic rate when first seen was +25%, his weight 59.8 kilograms. At the end of two and a half months' rest, the basal metabolic rate was +24%, the body weight 56.2 kilograms. The pulse rate had increased a little during this period (see Figure III.). Partial thyroidectomy

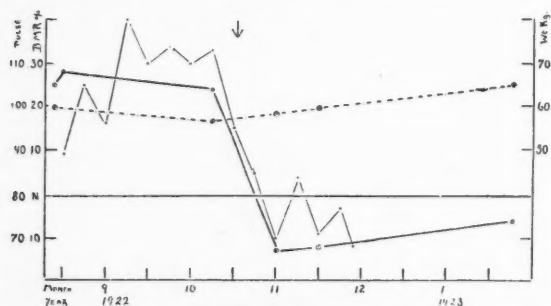


FIGURE III.

(Case 6.) Readings before operation taken whilst patient rested in bed. Arrow indicates operation, five-sixths of gland removed. The heavy continuous line indicates the basal metabolic rate. The light continuous line indicates the pulse rate. The interrupted line indicates the body weight.

was performed; the results of this operation are described in Group IV.

Case 7.—A female, *aetatis* twenty-nine years, married, had suffered for four years from symptoms of moderate hyperthyroidism, including loss of weight, moderate tachycardia, evident exophthalmos, palpitations and shortness of breath. She was first seen by the author at the end of five months' rest in bed. The basal metabolic rate was then +25%, the body weight 37.6 kilograms. Two months later hemi-thyroidectomy was performed (compare Group IV.).

Case 8.—A female, *aetatis* thirty years, unmarried, had exophthalmic goitre. She had noted the onset of symptoms ten years before. Three years prior to the period under review, hemi-thyroidectomy was performed. After this she improved, but two years later noted a return of symptoms, such as lassitude, loss of weight, nervousness, palpitations and exophthalmos. She rested at home for six months, at the end of which period she was but slightly better. X-ray treatment was then commenced in addition to rest (see Group III.).

Case 9.—A female, *aetatis* fifty-two years, had suffered for eight years from hyperthyroidism. One year after the onset of symptoms, hemi-thyroidectomy was performed. Slight improvement followed, but she was compelled to rest a year. From that time onwards periods of fair health alternated with exacerbations of the disease during which the patient was unable to exert herself. Early in 1923 she became worse and rest failing to relieve her, X-ray treatment was advised. At this time

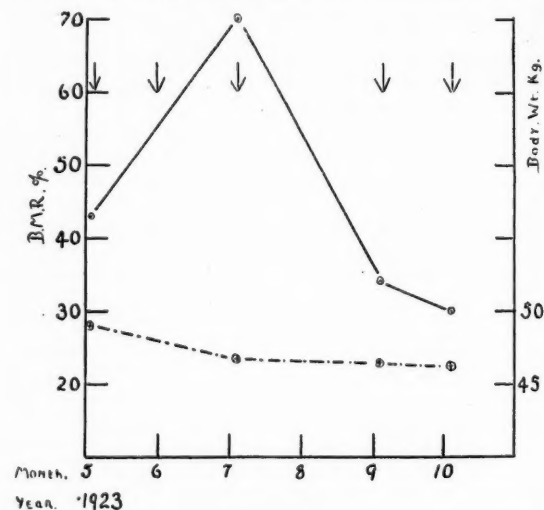


FIGURE IV.

(Case 9.) Arrows indicate dates of treatment by X-rays (deep therapy). The continuous line indicates the basal metabolic rate. The interrupted line indicates the body weight.

her weight was 48.1 kilograms and the basal metabolic rate was +43%. Details of radiological treatment and the further progress of the case are given later under Group III. (see Figure IV.).

The material available is not sufficient to demonstrate the effect of rest on the basal metabolic rate, as the majority of the patients were not seen before the commencement of repose. All of the members of this group excepting one at the end of different periods of rest showed a



basal metabolic rate of more than + 25%, together with persisting symptoms of hyperthyroidism. In the one exception, a case complicated by the co-existence of *diabetes mellitus*, the basal metabolic rate fell to + 17%.

Rest appears to be insufficient to cure exophthalmic goitre, though in some cases it is followed by marked amelioration of symptoms.

### Group III.

Five patients have been treated by X-rays.

Case 8.—A female, *aetatis* thirty years, has been mentioned under Group II. On March 26, 1923, she was treated by deep X-ray therapy, being given a one-third of an erythema dose. On April 17, 1923, her basal metabolic rate was + 30%; her body weight 57.6 kilograms. On May 3, 1923, a second exposure of one-fifth of an erythema dose was given. On June 20, 1923, her basal metabolic rate was normal. Her body weight was 59.42 kilograms. On September 24, 1923, the patient felt much better, but became distressed on exertion. Her pulse rate was one hundred. Her weight was not ascertained, but was obviously greater than before.

Case 9.—A female, *aetatis* fifty-two years, has already been mentioned under Group II. On May 1, 1923, her body weight was 48.1 kilograms, and her basal metabolic rate + 43%. She was treated by deep X-ray therapy, five exposures being given in five months. The dose was increased from one-third to two-thirds of an erythema dose. There was very little change in the clinical picture during the period of treatment. The weight and the basal metabolic rate were but little affected. The patient felt somewhat better, but was still incapable of any exertion without becoming distressed. An abrupt increase in the basal metabolic rate followed an attack of influenza. This is not an uncommon effect of this disease (see Figure IV.).

Case 10.—A female, *aetatis* twenty years, unmarried, had exophthalmic goitre. After hemi-thyroidectomy in 1920 she was well for two years. Then she noticed shortness of breath, tremor, exophthalmos, palpitations and loss of weight. August 29, 1922, she had a pulse rate of 132; her body weight was 60.3 kilograms and her basal

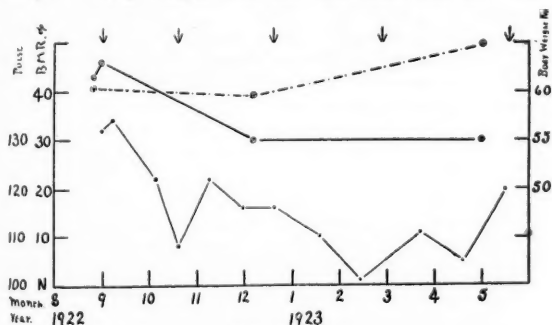


FIGURE V.

(Case 10.) Arrows indicate dates of treatment by deep X-ray therapy. The heavy continuous line indicates the basal metabolic rate. The interrupted line indicates the body weight. The light continuous line indicates the pulse rate.

metabolic rate + 46%. Treatment by deep X-ray therapy was then commenced. She was given six exposures in fourteen months, the dose increasing from one-sixth to three-fifths of an erythema dose. After the first treatment

the basal metabolic rate fell to + 30% and was still at this level after the fourth (see Figure V.).

Case 11.—A female, *aetatis* fifty-four years, married, had symptoms which had been present for seven years. When first seen, her condition was bad, the heart being greatly damaged and the auricles in a state of fibrillation. She was very thin, tremulous, nervy and had evident exophthalmos. One exposure to the X-rays, given before she was seen by the author, had apparently improved her state of health. On May 26, 1923, her body weight was 49.8 kilograms and her basal metabolic rate + 64%. On May 29, 1923, a second exposure of deep X-ray therapy equivalent to one-fifth of an erythema dose was given. On June 27, 1923, the third treatment of one-quarter of an erythema dose was given. On July 18, 1923, her weight was 52.6 kilograms and her basal metabolic rate + 55%. On July 26, 1923, she was given the fourth treatment of one-fifth of an erythema dose. Clinically she had improved slightly during the three months under treatment. She has since died of heart failure.

Case 12.—A female, *aetatis* thirty-nine years, married, had a toxic adenoma. Symptoms had been present for one year. She had not noticed at what period the thyroid became enlarged. When first seen, there was a swelling of the right lobe. She had lost weight, was nervy and suffered from palpitations. There was no exophthalmos. On December 6, 1922, her body weight was 44.5 kilograms and her basal metabolic rate + 36%. On December 11, 1922, deep X-ray therapy of one-half of an erythema dose was given. On December 16, 1922, her body weight was 43.5 kilograms and her basal metabolic rate + 22%, while on May 2, 1922, her weight was 42.6 kilograms and her basal metabolic rate + 48%.

The material available is not sufficient to enable the effect of X-rays in the treatment of hyperthyroidism to be assessed.

Three of the patients in this group had previously had one lobe of the thyroid removed. One of these was greatly benefited by irradiation of the thyroid gland (Case 8). The other two improved slightly after the first exposure, but were not much affected by further treatment. A fourth sufferer after submitting for years to the tender mercies of various herbalists, came to the radiologist for relief. Her heart had suffered severe damage. She appeared to be somewhat improved by X-rays, but died later from heart failure (Case 11).

In this series, radiological treatment has usually had a beneficial effect, but has not cured the disease. Patients are often sent to the radiologist when other methods have failed and the disease has wrought havoc on the body tissues.

### Group IV.

Twelve patients were subjected to operation. One of these has already been alluded to under Group II., as ligature of the superior thyroid arteries was resorted to when the patient was practically in *extremis* (Case 3). Three of the patients had been subjected to operation some years before the period under consideration and came for further treatment on account of a recurrence of symptoms. In all three the previous operation had been a hemi-thyroidectomy. The progress of these patients during the period under review is referred to under Group III.

The operative procedure in the remaining eight patients is summarized as follows.

Partial Thyroidectomy	Exophthalmic Goitre	Toxic Adenoma
One lobe	2	
$\frac{1}{3}$ of gland	1	
More than $\frac{1}{3}$ of gland	3	1
one stage		
two stage	1	

Case 7.—A female, *aetatis* twenty-nine years, married, has already been mentioned under Group II. On August 1, 1922, her pulse rate was 96, her body weight was 37.6 kilograms and her basal metabolic rate + 25%. On September 27, 1922, the right lobe of the thyroid gland was removed. It was enlarged and sent a process behind the trachea. On October 6, 1922, her pulse rate was 96, her body weight was 35.8 kilograms and her basal metabolic rate was + 35%. By April 21, 1923, she had improved clinically. Her pulse rate was 80, her body weight 43.55 kilograms and her basal metabolic rate normal. On September 29, 1923, she stated that she had felt much better since operation. Her pulse rate was 100, her body weight was 42.2 kilograms and her basal metabolic rate + 24%.

This return of symptoms of hyperthyroidism following hemi-thyroidectomy is of interest and is discussed later.

Case 5.—A female, *aetatis* thirty-six years, married, had exophthalmic goitre (see under Group II.). On April 18, 1922, her weight was 53.3 kilograms and her basal metabolic rate + 48%. On April 22, 1922, rest having failed to cure her, the right lobe of the thyroid gland was removed. On May 10, 1922, the basal metabolic rate had fallen slightly. On May 12, 1922, two-thirds of the remaining lobe were removed. On July 25, 1922, the basal metabolic rate had fallen to + 15%.

She wrote from India on August 1, 1923, to say that she was quite well, had gained in weight and was able to play tennis (see Figure II.).

Case 6.—A male, *aetatis* twenty-two years, has already been mentioned under Group II. Operation was performed on October 17, 1922. About five-sixths of the thyroid was removed. Soon after the operation he commenced to put on weight; the pulse rate diminished and the basal metabolic rate fell to below normal. When last seen on January 23, 1923, he felt well. There were no signs of hyperthyroidism, except that exophthalmos was still evident. He complained of "pins and needles" in his hands and feet. His body weight had increased by six kilograms. The basal metabolic rate was - 3%.

In a letter from Tasmania dated August 30, 1923, he wrote that he was back at pick and shovel work and felt in his own words "as well as ever." His pulse rate was 76 and his body weight 72.6 kilograms (see Figure III.).

Case 13.—A female, *aetatis* forty-one years, married, had a toxic adenoma. She had noted a lump in the throat five years before coming for treatment. A year later she noted palpitations, shortness of breath, and trembling; there was no exophthalmos. A sudden increase in size of the thyroid gland with pressure symptoms forced her to seek medical aid. A large globular swelling was present in the isthmus and lower right lobe. On July 21, 1922, her body weight was 61.7 kilograms and her basal metabolic rate + 26%. On September 5, 1922, partial thyroidectomy was performed. The right lobe containing a large adenoma and portion of the left lobe and isthmus were removed. On September 16, 1922, her body weight was 63.0 kilograms and her basal metabolic rate + 17%.

In January, 1923, she was performing her house duties, her weight being 66.1 kilograms. On May 12, 1923, her body weight was 64.9 kilograms and her basal metabolic rate - 7%. On September 24, 1923, she said that she felt "splendid."

Case 14.—A female, *aetatis* thirty years, married, had exophthalmic goitre. She first noted sudden enlargement of the thyroid gland in June, 1922. For two months she suffered from attacks of vomiting, dyspnoea, severe palpitations, loss of appetite and rapid loss of weight. When first seen she was thin and nervy, obviously very ill. The thyroid gland showed a swelling in the lower right lobe and isthmus; there was no exophthalmos. The urine contained pus. On September 15, 1922, pulse rate was 100; her body weight was 41.4 kilograms and her basal metabolic rate + 70%. On September 16, 1922, her basal metabolic rate was + 68%. On October 19, 1922, about five-sixths of the thyroid were removed. The patient objected to further basal metabolic rate estimations until May, 1923.

A remarkable transformation had occurred in the meantime. She now looked a picture of health, felt well, had no palpitations, no dyspnoea except on excessive exertion, no exophthalmos; her urine was clear. On May 5, 1923, her pulse rate was 75, her body weight was 70.0 kilograms and her basal metabolic rate - 4%. On October 17, 1923, the patient was well, was able to attend to her home duties, she had no palpitations, no tremor. Her pulse rate was 78. She had developed slight exophthalmos, which was not present prior to operation.

Case 15.—A male, *aetatis* nineteen years, noted the onset of symptoms six months prior to admission, but had been refused by the Navy one year before, because of tachycardia. There was evident exophthalmos, general enlargement of the thyroid, loss of weight, tremor and tachycardia. On September 29, 1922, his pulse rate was 100, his weight 54.4 kilograms and his basal metabolic rate + 47%. The next day about five-sixths of the thyroid were removed. On October 7, 1922, his pulse rate was 100. His weight was 50.8 kilograms and his basal metabolic rate + 39%. His weight was 54.4, 54.2 and 54.88 kilograms on December 1, 1922, February 1, 1923, and October 3, 1923, respectively, while on the same three dates his basal metabolic rate was + 14%, - 1% and normal.

The patient can now ride a bicycle for miles or swim one hundred metres without distress. He is looking for a position as able-bodied seaman. Exophthalmos is still evident (see Figure VI.).

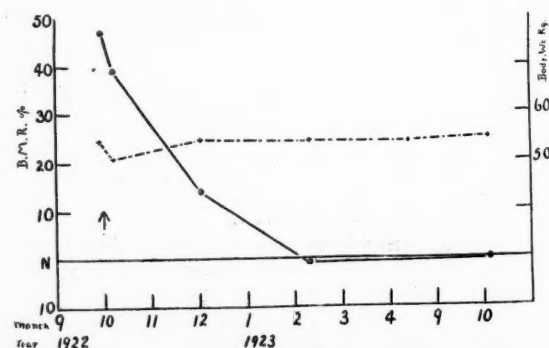


FIGURE VI.

(Case 15.) Arrow indicates date of sub-total thyroidectomy. The continuous line indicates the basal metabolic rate. The interrupted line indicates the body weight.

Case 16.—A female, *aetatis* fifty-seven years, had classical signs of exophthalmic goitre for three years. On November 3, 1922, her pulse rate was 88, her weight was 49.1 kilograms and her basal metabolic rate + 38%. On November 22, 1922, her pulse rate was 84, her weight was 46.3 kilograms and her basal metabolic rate was + 36%. On November 30, 1922, partial thyroidectomy was performed. A small portion of the left lobe and isthmus was left *in situ*. On February 3, 1923, she felt much better. The palpitation was less, the tremor was absent, but the exophthalmos was evident. Her weight was 52.2 kilograms, her basal metabolic rate was + 3%. On August

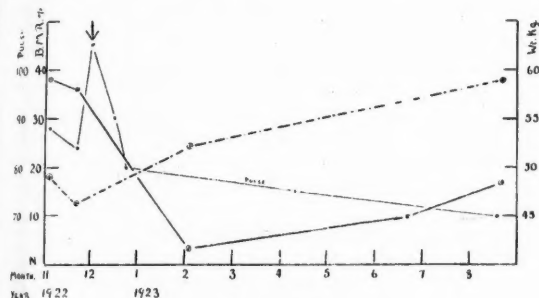


FIGURE VII.

(Case 16.) Arrow indicates date of operation two-thirds thyroidectomy. The light continuous line indicates the pulse rate. The heavy continuous line indicates the basal metabolic rate. The interrupted line indicates the body weight.

22, 1923, she felt worse again after an attack of influenza. She got very tired on exertion, had palpitation and shortness of breath. The exophthalmos was still evident. Her pulse rate was 70; her weight was 58.9 kilograms and her basal metabolic rate + 17% (see Figure VII.).

Case 17.—A male, *aetatis* nineteen years, had classical exophthalmic goitre of nine months' duration. There was exophthalmos, enlargement of the thyroid, tremor tachycardia, palpitation, loss of weight and strength. On July 14, 1923, his pulse rate was 112, his weight 51.7 kilograms and his basal metabolic rate + 51%. On August 2, 1923, his pulse rate was 125, his weight 51.7 kilograms and his basal metabolic rate was + 88%. On August 20, 1923, the right lobe of the thyroid was removed. On October 4, 1923, he stated that he felt much better since the operation. There were no palpitations and less exophthalmos; the tremor was still present. His weight was 53.5 kilograms and his basal metabolic rate was + 32%.\*

The patient is to come in for a second operation in the near future.

In this group there were five hemi-thyroidectomies. Three of the patients returned for further treatment after a lapse of some years and were sent to the radiologist. In Case 7 operation was followed by a return of the basal metabolic rate to normal and improvement generally. Later the pulse rate increased; there was loss of weight and an increase of 25% in the basal metabolic rate. In the remaining patient there was definite improvement after operation, but it is evident that further interference is necessary.

The five patients in whom a more extensive resection was undertaken, have done well. Four are apparently as well as ever before. In the fifth the isthmus and portion of one lobe were left. After returning to normal the

basal metabolic rate rose to + 17%. This reading was obtained shortly after an attack of influenza; the rise in

#### Conclusions:

Exophthalmic goitre and toxic adenoma of the thyroid gland are diseases which tend to progress to the detriment of all tissues of the body; the heart and nervous system suffer more especially.

The most effective measures at present available in the treatment of these cases are rest, X-rays and partial thyroidectomy.

Rest is but rarely sufficient, though generally followed by slight improvement.

Treatment by X-rays in this series was not generally successful, but in certain cases is probably of great use.

Removal of one lobe is usually followed by great improvement, but recurrence of symptoms appears to be common.

Radical removal of two-thirds to five-sixths of the gland offers the best chance of cure at present available.

I wish to thank the various physicians, surgeons and radiologists who have permitted me to publish these cases: also Professor Osborne, Dr. Young and Dr. Paterson who have helped me to perfect my technique. Dr. Williams, of the Melbourne Hospital, and Dr. Mackay, of the Alfred Hospital, have by their cooperation facilitated my work. whilst Dr. Kellaway, Director of the Institute, has kindly guided me in the writing of this paper.

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#### GENERAL ANAESTHESIA IN CASES OF EXOPHTHALMIC GOITRE.

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IN these remarks any preparation of the patient prior to the day of operation will not be considered, apart from emphasizing the advantage of insuring a night's rest by the use of barbitone, "Aspirin" or some such drug on the evening previous to the day of operation.

#### Morphine and Atropine.

The question of the preliminary hypodermic injection of morphine and atropine is one that always evokes a discussion. After a careful study by the use of a preliminary injection to every patient presenting himself for anaesthesia, I have quite decided that it is neither a help to the anaesthetist nor a benefit to the patient and what applies in other cases applies equally in cases of exophthalmic goitre.



Atropine especially has many advocates for its use in these cases, as a means of checking salivation; and though I do not think it is of any material help, I allow it if desired by the surgeon. If morphine is given under similar conditions, it is allowed under protest.

It is claimed that morphine quiets the patient and removes all excitement and dread of the operation. By the same person one is told that the dose is so small that any undesired effect is not produced, if these are advanced as a reason against giving the morphine.

Time will not allow me to go into the question very fully, so I will only state that my main objection to morphine is that it is impossible to tell that even a small dose will not interfere dangerously with the medullary centres. In passing I can recall the case of a patient, one of the most frightened exophthalmic goitre patients I have seen. No amount of persuasion from the Sister and the surgeon could make her have a hypodermic injection and yet she was quite ready for the anaesthetic.

I have stated that for a while preliminary hypodermic injections were more or less routine. Since a particular patient came for treatment, when many doubts had arisen as to the advisability of the injections, their routine use has been discontinued. This was in 1916, I think.

The patient was a female weighing forty-two kilograms (six stone, eleven pounds). She had a malignant goitre. She was given 0.008 gramme ( $\frac{1}{8}$  grain) of morphine, and 0.0003 gramme (1-200 grain) of atropine one hour before the operation. She was given 135 cubic centimetres ( $4\frac{1}{2}$  ounces) of a 75% solution of ether in olive oil *per rectum*. She was not well under the influence of the anaesthetic at the start and was given a little ether by the open method. Her reflexes remained present. Her bowel was well washed out after the operation. The reflexes deepened when she was taken back to bed and her pupils became pin-point. This patient died on the second day and it seemed as if the morphine helped this to happen.

Any way since that day I have practically never used rectal anaesthesia and have given up the preliminary use of morphine and have had no reason for regret in so doing. At times where the bad practice exists for its routine use, my patients have been injected when in these hospitals.

In this connexion in a recent correspondence over ether versus chloroform in *The British Medical Journal* ether was condemned by one because he knew of two patients who had died from overdoses of atropine given as preliminary injection.

It does not seem to be generally realized that practically every patient for any operation can be surely and safely anaesthetized by ether alone, that is, without the help of preliminary medication or of chloroform or ethyl chloride during induction.

It took me a long while to do without a little chloroform at the commencement and I tried to do so in many patients with exophthalmic goitre in whom I had to fall back on "C-E" or "A-C-E" before I was successful and that with a comparatively short period of induction.

The two main difficulties in these cases are, first, condition of the heart, second, the pressure on the trachea, due either to the enlarged gland or to manipulations of the surgeon causing interference with the air-way.

### 1. Condition of Heart.

The action of atropine inhibiting vagus control may be quite an important undesired factor; anyway it must be thought of when use of atropine is advocated.

The giving of chloroform to a patient with a heart perhaps already fibrillating, especially if the anaesthesia is light, as it should be in these cases, must assuredly soon bring about disaster; furthermore, it sometimes happens that a general anaesthetic has to be given in cases where the operation has been commenced with infiltration of neck with "Novocaine" and adrenalin solution. Here again chloroform must not be given. Ether then must be the anaesthetic agent in exophthalmic goitre as gas and oxygen are not within the range of practical use.

### 2. The Pressure on the Trachea.

Fortunately this is as a rule not a frequent feature of exophthalmic cases, being more common in parenchymatous and malignant goitres. When it is present to a considerable degree, special methods of anaesthesia to overcome dangers arising from it may be used, such as intra-tracheal anaesthesia.

During the operation every effort should be made to keep the patient's air-way dry. As already indicated I do not think it is wise to rely on the use of atropine for this. Ether is often blamed for mucus being over-secreted, but if given warm and the air-ways kept clear, there is no excess of carbon dioxide in the blood, the mucus can be kept well in check; and I hold that it is an advantage not to have anything that would disguise the condition of the patient. By giving atropine glandular activity is interfered with and inhibited; and although the vascular state of these glands may be such as would result in over activity, the atropine prevents it. Along with this from manipulation of the thyroid gland there may be over-activity and extra-thyroid secretion is passed into the circulation and any contra-secretion is even less than normal during the operation. This may be quite a factor in subsequent acute thyroid intoxication seen after some operations.

One of the most difficult things to decide in all operations is the ability of the patient to go through what is proposed to be done. Once an operation is started, it cannot be terminated at a moment's notice; but in exophthalmic goitre it may have to be decided whether the operation should be stopped after one lobe is removed. The untoward signs during operation to be noted by the anaesthetist are: (i.) The pulse rate is increasing rather than diminishing; at the outset there is probably a pulse rate above the patient's usual rate. This is seen in most operation patients and this extra rise disappears again as patient settles down to the anaesthetic. (ii.) Sweating, indicating a low vasomotor tone or at least a disturbed vasomotor tone due to over-intoxication. This in a great many other conditions also may be a great help as to patient's state and as to prognosis. (iii.) Over-secretion of mucus and (iv.) any tendency to cyanosis. In these two it is taken for granted that a free air-way has been maintained and that the onset of both is of cardiac origin. (v.) Occasional sighing respiration. I cannot explain this and though it may be present in patients when everything goes along well, there are circumstances in which it certainly indicates that the patient is far from well and it should always be looked on as a possible dangerous state.



With any of these present it is wise to finish up as soon as possible and to be satisfied with the removal of one lobe if the surgeon is still dealing with the first lobe when the sign appears; the second stage operation can be done as soon as seems advisable. This does not mean that the whole operation cannot quite often be done at one stage; but in case of doubt it is better to err on the side of safety. I can recall operations during which I have been asked the condition of the patient at the end of removal of one lobe and have said that it was good and after a further procedure it has meant a very hard tussle with the patient during convalescence or even a fatal result. I know it has been argued by doing the whole operation at one sitting there is less likelihood of a bad convalescence as the removal of one lobe is not sufficient to help materially; but I think from my point of view that when any of the above symptoms appear, I must advise the surgeon to stop.

There is no doubt that an exophthalmic goitre patient will stand operation with anaesthesia far better for something apart from the goitre. For example, a patient was sent down from the country with such extreme exophthalmos that both corneas had ulcerated deeply. To save the eyes a blepharoplasty had to be done. This was very difficult owing to the extreme tension on the palpebral margins and the duration of the anaesthesia was considerably longer than would have been desirable had the operation been on the thyroid. Yet the patient was so little disturbed by the ether that she was ready for operation on the thyroid on the following day, when the right lobe was removed; a second stage operation was done later.

And it is because of the fact that there is more stirring up of the condition when the gland is being operated on that the question of time enters very largely. I know that many of you may recall patients who have gone safely through with anaesthesia when the operation has taken the best part of an hour or longer; still there are many that could not tolerate that and it would seem that after a certain time almost every second counts and it is desirable to be finished before that time. It may be said, if that is so, why is ether used at all. Perhaps it would be wise not to use it, if all patients would submit to local anaesthesia.

In these patients ether is given by Kelly's intra-tracheal apparatus, but only blowing ether through under a mask. The intra-tracheal method is seldom used for exophthalmic goitre operations. I remember Dr. Dunhill telling me that Finney has his patients under light enough ether anaesthesia to talk the whole time. I have kept patients at that stage for other operations, but have not done it with goitre for two reasons. In the first place patients are so lightly anaesthetized that they may wriggle out of position. In the second place they are so lightly anaesthetized that they are liable to vomit.

But the anaesthesia is kept very light indeed, just a shade deeper than this, but not deep enough to permit the tracheal tube to be inserted without much coughing; this is a reason why in the majority of patients the operation is performed without the intra-tracheal tubing, because lighter anaesthesia can be maintained.

Given in this way ether is not irritating, especially if partly disguised by oil of orange. A few days ago a

doctor who was being anaesthetized said: "I always thought ether was irritating, but it is not." That is generally true when given in this way. The advantages are the warmth and uniformity; these help considerably in maintaining a safe, light anaesthesia.

## TECHNIQUE OF THE OPERATION FOR EXOPHTHALMIC GOITRE.

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### Preparation.

EMPHASIS must be laid on a careful preliminary treatment and the choice of the most propitious time in the course of the disease in which to operate. In the actual operation the factors which are of the utmost importance, are the method of anaesthesia, the brevity of the operation and skilfulness of the operator. In no other operation does surgical technique and management play such a rôle. Long operations and much handling in very bad goitres under general anaesthesia often mean death, because the margin of safety is so extremely small.

### Local Anaesthesia.

Figure I. shows a method of inducing local anaesthesia which I have found most useful. Novocain solution is fed

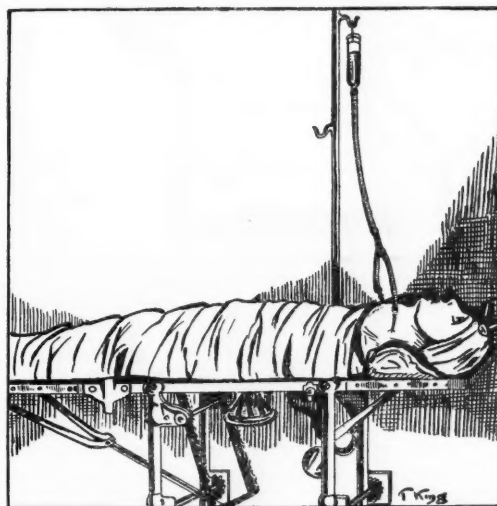


FIGURE I.  
Local anaesthesia by gravity method.

into tissue planes under gravity and the region anterior and posterior to the thyroid can be imbedded in a sea of oedematous anæsthetic tissue, just like the oedematization that goes on in a sub-mammary saline solution injection and this can be done while vessels are being tied in other regions. This I have found to simplify the local anaesthesia problem. It saves time, makes an absolutely painless operation and its action is not noticed by the patient.

Local anaesthesia is by far the safest and some patients with very bad symptoms, who will die under ether, will get through with local anaesthesia. With it and with the

method of graduated operation described later it should be possible to get almost every patient through operation, even though they are very seriously ill. When there is any doubt as to the gravity of a case, local anaesthesia should be used or where the operator is slow and would subject the patient to a long etherization. The use of local anaesthesia may be limited on account of the temperament of the operator or of the patient.

The position employed in thyroidectomy under general anaesthesia is intolerable to patients when the local method is employed. They complain bitterly of the ache of the hyper-extended neck and also of their back. The weight of many forceps on the neck is also most unpleasant. To avoid this I sometimes operate with the patient in the sitting position, as if in a chair (see Figure II.).



FIGURE II.  
Position for local anaesthesia.

If in operating under local the gland be dislocated as is done under general anaesthesia the patient will experience a choking sensation from tension on the trachea and may sit up in a panic gasping for air. It is therefore better to cut the superior thyroid arteries in position; this is very easy to do in the operation subsequently described and will allow the gland to come up easily without tension on the trachea and deeper structures. It is wise to leave a little film of thyroid tissue on the trachea; it prevents intra-tracheal sensations and chokings and spasms. One advantage of local anaesthesia is that the patient can be forced to drink large quantities of water immediately after the operation and thus help eliminate the post-operative toxæmia.

#### General Anaesthesia.

Improvements in general anaesthesia have enabled us to do many more operations under ether than previously.

Mott's dosimeter apparatus is used in my practice for giving pharyngeal or intra-tracheal ether.

A short operation under ether for goitre is essential for

the life of the patient. Where the thyroid is very large and tracheal obstruction might be a factor, intratracheal insufflation should be used, but in a number of exoph-

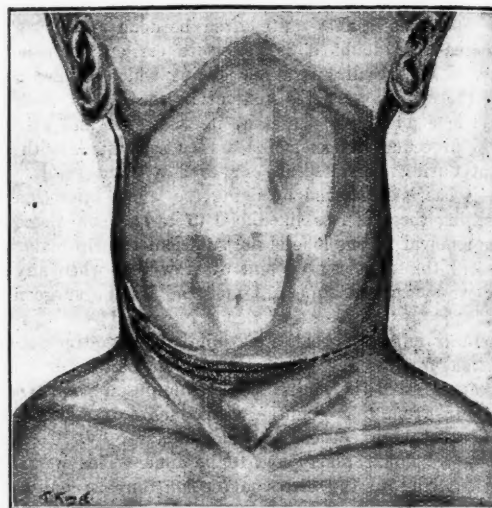


FIGURE III.  
Incision for right lobectomy.

thalmic goitre patients whose thyroid lobes are not very big I use the lightest possible pharyngeal insufflation of ether, because a lobectomy can be done with very light anaesthesia and a very little expenditure of ether but the introduction of the laryngeal tube involves a deeper anaesthesia and some waste of time.

#### The Operation and Methods of "Staging."

It is of great practical value to get a good position of the neck and to maintain it. A good position is easy to obtain at the beginning of the operation, but there is the greatest difficulty in maintaining it, because as the lightest possible anaesthesia or local anaesthesia is used, the patient naturally shrinks herself out of position. It is impossible to pick up vessels cleanly and under sight especially in the region of the recurrent laryngeal nerve if the position is not good. In cases where this very light anaesthesia is necessary, I frequently use a form of head rest into which the patient is strapped.

#### Operation.

I employ a method of approach to the thyroid that lends itself to staging and that was suggested to me by Professor Watson, of Adelaide.

This operation, the steps of which are illustrated in Figures 3, 4, 5, 6, 7, 8, 9, 10, 11 has the following advantages: (i.) It avoids the cutting of the big veins of the neck and much hæmorrhage in the superficial planes. (ii.) It gives direct access to the main vascular trunks of the thyroid. (iii.) Section of infra-hyoid muscles is unnecessary, but it may easily be done if difficulty is encountered. (iv.) It is suitable for subtotal thyroidectomy in one or two stages. (v.) The operation does not take long; it should be possible to do a lobectomy in twenty minutes.

It is necessary to use good forceps because if they slip off, the vessel retracts and is most difficult to find and the recurrent nerve is more often picked up in the attempt to recover the vessel than in any other way. I use very fine silk for ligatures. I find that sooner or later cat-gut slips off and gives reactionary hemorrhage, and I have had no trouble from the silk. The drainage is through the sterno-mastoid to avoid wounding veins which are massed above the manubrium (Figure 11).



FIGURE IV.

1 Finger with gauze stripping up sub-platysma plane, 2 Infra-hyoid muscles, 3 Sterno-mastoid pulled back to show omo-hyoid muscles, 4 Anterior jugular veins.

The first stage in a subtotal thyroidectomy is a quick lobectomy which is done with local anæsthesia, if the pa-

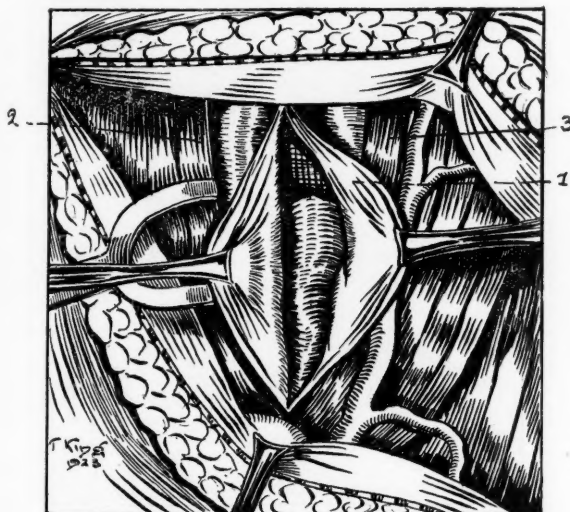


FIGURE V.

Omo-hyoid (3) pulled medially, sterno-mastoid (2) pulled laterally and fascia with muscle fibres (1) opened over superior pole of thyroid gland.

tient is very ill. Ether anæsthesia may be used for this stage if patient's condition permits.

The second stage is done ten days later and before the wound has healed. This can nearly always be done under ether anæsthesia as it is a very short operation and the patient is now much improved, but in a few patients with

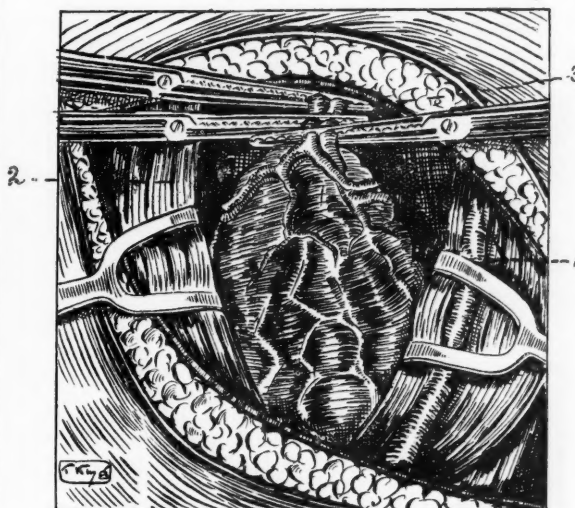


FIGURE VI.

1 Omo-hyoid and other infra-hyoid muscles, 2 Sterno-mastoid, 3 Double clamp on superior thyroid artery.

very severe symptoms I have allowed the wound to heal up and have done the second stage in a month under local anæsthesia.

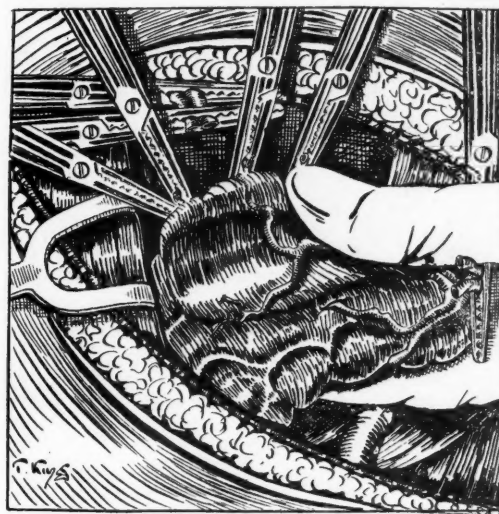


FIGURE VII.

Lobe of thyroid erected and arteries clamped before being cut.



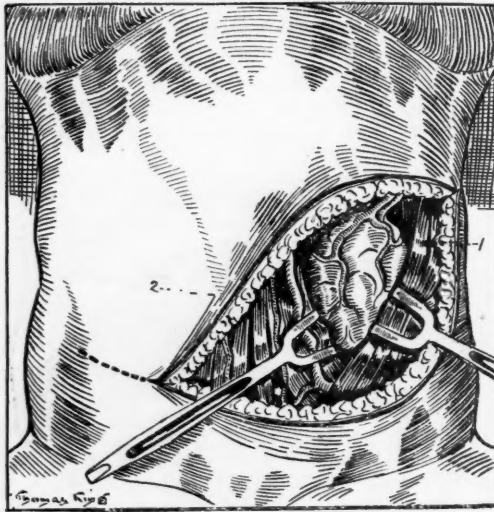


FIGURE VIII.

Left lobe of thyroid exposed between sterno-mastoid (1) and omohyoid (2).

The advantages of the ten day's stage are (i.) there is a very big drop in the basal metabolism and the resistance of patient is much improved, (ii.) in ten days the exposure of the thyroid partly through the unhealed wound and partly through virgin tissue is accomplished quickly with no adhesions and little bleeding; every operator knows the intense difficulties because of these in the ordinary secondary operations on the thyroid, (iii.) the

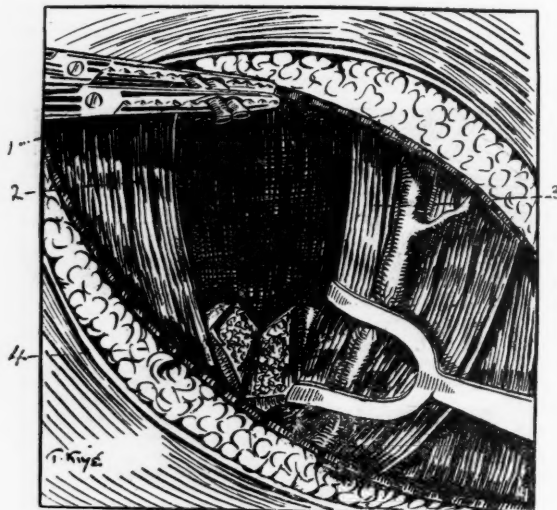


FIGURE IX.

1 Superior thyroid artery cut, 2 Sterno-mastoid muscle  
3 Infra-hyoid muscle, 4 Excavated lower pole of one lobe  
which has been left; isthmus and other lobe have been  
removed.

second stage if done months later, is a much more lengthy, dangerous and bloody procedure, (iv.) if the patients leave

hospital after the first stage they frequently fail to return because of the temporary improvement and therefore the surgeon fails to cure them, (v.) those patients who are very ill prefer two short safe sittings at a brief interval under a general anaesthesia rather than one big operation under local anaesthesia.

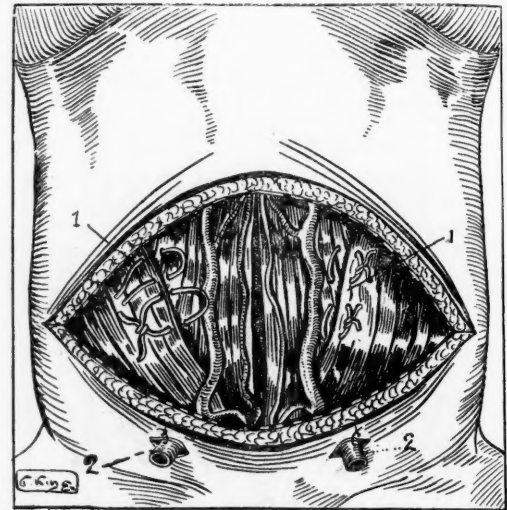


FIGURE X.

1 Infra-hyoid muscles approximated to sterno-mastoid by mattress sutures, 2 Drainage tubes through sterno-mastoid to avoid venous trunks.

The treatment by operation of acute exophthalmos with ulcerating cornea is shown in Figure 12. In this case, which was referred to in my paper read in the Medical Section, the lids were sutured and closed by Dr. Edward Ryan.

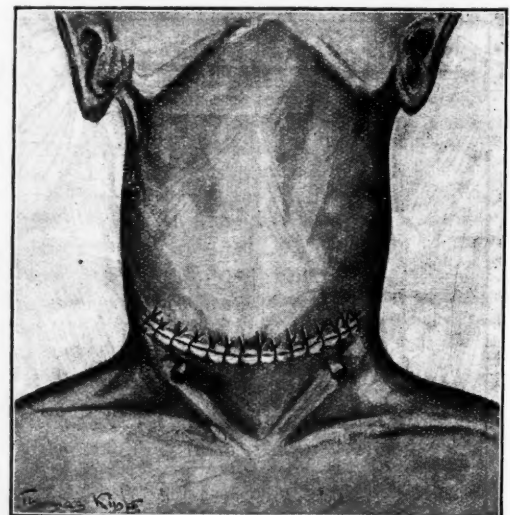


FIGURE XI.

Incision closed with interrupted sutures taken out in from two to four days.



Operation on patients who have been exposed to X-rays is very difficult. Under these circumstances, the gland has lost its surrounding tissue planes, it is very liable to bleed, probably because of friability of the vessels; it has lost some of its glandular elements and if the usual amount of thyroid gland be left, myxœdema may result. This actually happened in one of my patients.

#### The Management of Accidents and "Scares" That Are Likely to Occur in Thyroidectomy.

Pressure or dragging on the trachea, especially in local anaesthesia, causes great trouble. If the patient shows signs of tracheal obstruction half way through the lobectomy, traction can be made by the lobe on the trachea in such a way as to open the lumen of the trachea or the neck may be flexed. In one operation under local anaesthesia everything went perfectly smoothly till I had dissected out a fair-sized branch of the interior thyroid; the moment I clamped this the patient got a severe and alarming spasm of the larynx. Spasm of the larynx occasionally occurs and is very disconcerting. It generally



FIGURE XII.

The operation for acute exophthalmos and ulcerating cornea.

passes off if the patients are allowed to recover from the anaesthesia. Of course, intra-tracheal anaesthesia would avoid this, but it is not always possible. When a patient starts to get fluid in the alveoli of the lungs and rattling on respiration, which we regard as a slight lung œdema, we always stop as quickly as possible.

Special attention should be paid in the post-operative treatment to hæmorrhage. If a large artery bleeds in the enclosed thyroid cavity after operation, it may cause asphyxia before the surgeon can release the clot. The nurse should have special instructions to deal with this. Attention should also be paid to post-operative acute thyroidism; the question of leaving the wound open and of giving iodine should be considered. Visceral compli-

cations, such as auricular fibrillation, should be treated in the recognized way.

I wish to acknowledge my indebtedness to Dr. Dunhill, my former colleague, many of whose methods I have adopted, and also to Dr. T. King, who has illustrated this paper.

Dr. HUGH R. G. POATE said that it was incumbent on him to impress to the previous speakers the very great pleasure they had given. The great thing that impressed him was the fact that exophthalmic goitre in Melbourne was regarded as a definite surgical complaint, while in Sydney the physicians held sway and it was only in the later stage that the surgeon was called in. The great difference in the mortality rates in these two cities spoke for itself. Mr. Devine's great experience had been made full use of and the presentation of his facts and figures was a matter for congratulation. Dr. Poate hardly liked to speak after such an authority, but the sum total of their knowledge was built up of the experience of many and he presented his few remarks for what they were worth.

From the records of the Royal Prince Alfred Hospital, Sydney, he had found that the total number of patients with exophthalmic goitre treated in the past thirteen and a half years had been three hundred and forty-four of whom only one hundred and eighteen had been operated on, with a mortality of 16% as against 10% in the medical wards. This he felt did not represent the true facts of the case, for the physicians tended to keep these patients until the condition was advanced and the surgical risk was thereby accentuated. Their experience in private practice was very much more favourable.

In 1915 thirty patients had been treated in the hospital of whom seventeen or 56% had died, but there had been eleven deaths among twelve patients in the medical wards. This fatal year might have been due to the increased nervous strain of the early days of the war.

The incidence seemed high in industrial centres and 55% of cases septic infection of the tonsil was seen. The average age was thirty-one years the youngest being fifteen years and the oldest forty-nine years.

Unfortunately no sharp distinction had been made in differentiating toxic adenoma from true exophthalmic goitre, but careful perusal of the histories had enabled him to sort them out. In the true cases the danger periods fell into two age periods, twenty to twenty-five and thirty-six to forty years. The first period concerned patients symptoms of recent origin; in the second the patients had symptoms for two years or more. Attention must be directed to the difference not only in symptoms, but in prognosis in toxic adenoma as compared with true exophthalmic goitre. Toxic adenoma seldom if ever produced exophthalmos. The goitre had been in evidence for some years and it was not until the patient reached the age of thirty-six years on the average that toxic symptoms began to show and the patient came to operation some three years later. The death rate was practically nil and after operation the basal metabolic rate fell within two weeks to normal limit.

In true exophthalmic goitre exophthalmos developed in 50% of patients within three months and in 87% in two years. The goitre developed on the average about the age of thirty to thirty-two years and symptoms developed within a few months. The patient came to operation on the average before they reached the age of thirty-five years.

The death rate was small, but appreciable and the basal metabolic rate only fell to normal limits in about 50% of

patients and then only in those moderately toxic. In the severe cases it seldom returned to normal limits. The basal metabolic rate was a very good guide as to the time for operation as patients on the rising tide of a toxæmia were bad subjects for operation interference. Preparation for operation was an important matter.

Rest from both bodily and mental strain was an essential. Copious fluids should be given so as to dilute the toxins and to aid in their elimination.

The patients should be well fed so that the effect of the toxins might be anabolic or at the expense of the food intake rather than katabolic or at the expense of the stored pabulum of the tissue cells.

The operation itself was fairly well agreed on. In Sydney they tended more to anatomical dissection than seemed to be the case in Melbourne, but the general principles were the same.

After treatment was carried out on the lines of pre-operative measures as to fluids and food. He found that 5% glucose in saline solution given *per rectum* was of great value. Excessive body heat should be eliminated by ice packs, if necessary. Morphine was given freely so as to control any restlessness. Cardiac vagaries were watched for and treated as might be necessary.

Recurrence of symptoms as a rule was due to too early resumption of muscular exertion or mental stress, to the failure to have eliminated some infective focus, to failure to remove sufficient gland substance at the operation and to irreparable visceral changes due to prolonged pre-operative toxæmia.

In conclusion he referred to the ætiology of the condition. So far they seemed to be very much in the dark, but on viewing the whole picture of the true disease it looked very much as if there was a fault in the secretory control of the gland. The histological structure of the true exophthalmic goitre was that of an organ in its fullest activity and not diseased.

Hunter and Royle had demonstrated the action of the sympathetic nervous system in controlling the plastic tone of muscle and an analogy could be drawn between the spastic muscle in its state of exaggerated plastic tone caused by excess sympathetic stimulation and to the over-action of the thyroid gland with its dilated arteries and by hyper-secretion. It was likely that further work might reveal that exophthalmic goitre was after all a disease of the sympathetic or para-sympathetic nervous system and perhaps a cure more scientifically correct than their present operation would reveal itself.

As it was the commonest symptoms which persisted, were tremor, palpation, tachycardia, loss of strength and muscle tone and exophthalmos, all of which could be ascribed to disturbance of function of the sympathetic nervous system.

DR. JULIAN SMITH agreed that exophthalmic goitre presented a very difficult problem. Everyone concerned had to be tuned to the minute, surgeon, anaesthetist and patient. All agreed that the patients required observation before they were subjected to operation. Speaking as a surgeon he asked what had any form of treatment other than surgical to offer? X-ray treatment might cure in one or two years or more, but with many individuals the time factor was of great importance. He had seen a few apparently cured by medical management, but this was not common. Most of the subjects of exophthalmic goitre drifted under medical treatment and many of them died.

If there were no definite improvement in two or three months, it was better to operate; delay involved danger and he could see no reasonable argument against early

operation. He had not derived much benefit in operating from tying the superior thyroid artery. With reference to anaesthesia Dr. Smith said he had passed through various stages. He had had considerable experience of local anaesthesia. Rectal anaesthesia was very nice when successful, but it entailed tedious preparation of the patient and there was always the element of uncertainty and to liability to local and to late complications. A combination of local anaesthesia with a minimum of general anaesthesia was very good, but he preferred local anaesthesia for the more serious cases and ether administered by the open method without preliminary alkaloids for the less severe.

As an instance of what could be done in an apparently desperate stage of the disease Dr. Smith related the history of a patient in whom there had been an extreme degree of heart failure, as indicated by hydrothorax and oedema of the legs. After aspiration of one and a half litres of fluid from the chest and the exhibition of digitalis there had been slight improvement. Operation had been undertaken under morphine and scopolamine narcosis and hemi-thyroidectomy performed. Ten days later portion of the other lobe had been removed and after a third operation for the removal of more thyroid tissue the patient had made a good recovery and had gained nineteen kilograms in weight.

DR. W. H. FITCHETT asked to be permitted to give his personal experience as one who had suffered from the disease under discussion. He had been treated off and on medically for fourteen years and eventually had been operated upon by Dr. T. P. Dunhill. Improvement had been immediate. As soon as the operation had been completed, he had had a sense of well-being and before the sutures had been removed, the very great improvement had been noticed. He had progressed to complete recovery.

He had been passed as a "first class life" for insurance four times since his operation. Before the operation he had been unable to carry out his intention of completing his medical course owing to repeated breakdowns under medical treatment. After operation he had decided to complete his course and had done so without embarrassments on the score of health.

DR. ARCHIE ASPINALL commented on the small drainage tube advocated by the opening speaker. He had always followed the procedure of MacCormick of using a large drainage tube and had seen small tubes become blocked. While subcuticular suture gave a nice scar, difficulties arose if the wound required reopening, as was sometimes the case. He preferred interrupted sutures. A stab wound in the shin often gave rise to troublesome oozing while drainage at the lateral end of the wound avoided this.

DR. O'GORMAN HUGHES in reply said that Dr. Trumble had clearly shown that the basal metabolic rate was the best single means of determining the most favourable time for operation and of checking the results. He had not seen permanent benefit from X-ray therapy. He favoured the preliminary injection of morphine and atropine and thought that it quietened the patient and allowed of a lighter degree of anaesthesia. He had not seen any bad results from the use of the preliminary injection. He had tried ligation of both superior thyroid arteries without improvement.

DR. GORDON CRAIG said that it had been shown from the papers that it was possible to cure patients with exophthalmic goitre and that the operative mortality was less than 2%. These figures compared well with any that could be obtained elsewhere. The operation did not remove the underlying cause of the disease which was still unknown.

The work of Professor Hunter and Dr. Royle on the sympathetic system might open up a new field of research in exophthalmic goitre. In the actual operation he relied to a large degree on the anæsthetist. Two of the speakers had referred to exacerbations and remissions in the intensity of symptoms. Basal metabolic rates demonstrated this variation. It was wiser to operate during a period of comparative quiet.

DR. W. J. STEWART MCKAY said that the bulging of the eyes, the enlarged thyroid, the rapid heart and the tremors were signs of disease whose seat was in the brain. He had been working for a long time in trying to find out the situation of the lesion. He thought that he had found it. Professor Hunter had told them on the previous day that the *corpus striatum* was the part of the brain which seemed to govern the sympathetic system. He, the speaker, did not hesitate in saying that exophthalmic goitre was a disease of the brain and that it was caused by shock which affected certain cells of the *corpus striatum*. Under normal conditions the *corpus striatum* exerted a governing influence on the sympathetic nerves which were connected with the sympathetic ganglia in the neck. These ganglia sent branches to the thyroid gland and a great branch entered the gland by the side of the superior thyroid artery. If shock and other causes brought about an alteration in the structure of the cells of the *corpus striatum*, the cells could not longer exert that proper governing influence on the impulses sent by way of the cervical ganglia and consequently the cells of the thyroid acted in an abnormal manner. The effect of the abnormal action was that more thyroxin was liberated than was required by the cells of the body with the result that there was increased combustion and a wasting of the fats of and other tissues of body. This was the explanation of the loss of weight that was almost uniformly observed in all subjects with exophthalmic goitre. The loss of weight was the expression of the over-combustion which was brought about by the action of thyroxin which governed the combustion of every cell of the body.

Having recognized that exophthalmic goitre was a disease of the brain, they should also recognize that adenomatous goitre with hyperthyroidism was a local disease and as the Mayos had pointed out the two diseases differed as much as typhus and typhoid fever differed. The one disease developed in a few weeks or month while the poisonous symptoms that appeared with adenomatous goitre might not appear until fifteen or twenty years had passed.

Acting on the hypothesis that the disease had its origin in the alteration of some of the cells of the *corpus striatum*, he had come to the conclusion that many of the returned soldiers who were said to have been suffering from shell shock, had really been suffering from a mild form of Graves's disease. They had been into battle and had seen some terrible sights; these sights had so affected the cells of the *corpus striatum* that they had become altered in structure and with this alteration there set in a decontrol of the sympathetic fibres going to the thyroid by way of the cervical ganglia and the superior thyroid artery. The result was that more thyroxin was liberated from the thyroid cells than was required or perhaps the thyroxin liberated was of a different composition to the normal product. In this way a condition that could not be distinguished from mild Grave's disease was established. He had persuaded a returned soldier who had suffered so much that he had become a gaunt, useless wreck, to allow him to remove both sides of the thyroid gland, leaving only a small portion on one side. In three months the man had become a strong, well-conditioned human being. Professor

Welsh had reported that the cells of the gland were changed in a way that he had never observed before.

Exophthalmic goitre was a disease that developed rapidly. He had treated a servant girl who had developed Graves's disease in three weeks from fright and shock connected with a burglary. Another patient had developed Graves's disease in its acutest form because she had expected her father to leave her money and he had not left her anything.

He maintained that many surgeons confused true exophthalmic goitre with adenomatous goitre with hyperthyroidism. As a result a low mortality was at times claimed for operations which would not have been achieved had the differential diagnosis been more carefully considered. They would probably resent this but their low mortality compelled him to think that they had included cases in their operation lists that would not have been accepted by the Mayos. Dr. McKay further maintained that one of the secrets of success in the treatment of this condition was not to do too much at once.

He claimed that he was one of the surgeons who had pointed out the real key to the successful way of operating on patients with true exophthalmic goitre. He had done this nine years previously. He had declared at that time that it was necessary to remove both sides of the thyroid gland, leaving only a small piece on one side. The surgeons in Melbourne refused to follow this rule; they removed only one side of the gland or one side and half of the other. Often this was not sufficient. He was glad that in America the principle was recognized. In regard to anæsthesia he stated that he never used local anæsthesia. He always used the intra-tracheal method and after the operation he relied on the free use of morphine. He always injected atropine twice a day for a week before the operation.

#### EMPYEMA.

By H. SIMPSON NEWLAND, C.B.E., D.S.O., M.B., M.S.  
(Adelaide), F.R.C.S. (England),  
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THE choice of empyema as the subject of discussion at this joint meeting of the Sections of Surgery and of Diseases of Children is, I think, a particularly happy one. The disease is of frequent occurrence and it comes within the scope of all, be he general practitioner, pathologist, bacteriologist or specialist in surgery, medicine or radiography. It is obvious that few diseases offer greater opportunities for "team work" and few in which it can be employed more profitably. I question whether the co-operation is always as close as it might be. Though we are all agreed as to the value of team work, we are far too apt to work in water-tight compartments. It is certain that any material advance in the prevention and cure of empyema can only be effected by the most intimate cooperation between those who have to do with it.

Two circumstances have conduced to quicken the interest of the profession in the study of this disease: (i.) The large number of penetrating wounds of the chest in the Great War and the successful application to them of the operative principles employed in treating gunshot wounds of the abdomen, head and knee joint; (ii.) the frequent occurrence of acute pleural suppuration in the great epidemic of pneumonic influenza.



The war provided the opportunity for demonstrating the safety with which the chest could be opened and intra-pleural manipulations carried out, besides affording much material for the study of pleural infection.

The influenza epidemic led to the appointment of an Empyema Commission in America whose terms of reference were the study of the disease in all its aspects. This "team" had an enormous amount of material at its disposal and it is not surprising that a noteworthy advance was made in the elucidation of the pathology of the disease. Further the applicability of the methods of military thoracic surgery to civil practice was tested.

It is manifestly impossible in the time at my disposal to cover the whole ground and I therefore intend to confine my remarks to that form of acute pleural infection which is one of the terminations of acute pneumococcal pulmonary inflammation.

A new conception of the pathology of empyema is not perhaps familiar to all and I propose to consider it briefly.

The lung like the *appendix vermiformis* is a viscus in a closed serous cavity. The lymphatic stream is from the pleural surface towards the hilum. The bronchial arteries are the nutrient arteries of the substance of the lungs.

The viability of the tissues at the periphery of a viscus just as in a limb is less than that of the tissues in the region of the hilum. Thus we know that the appendix tends to perforate or become gangrenous on its anti-mesenteric aspect. The site of the perforation or sloughing is the avenue along which the bacteria (*Bacillus coli communis* and *streptococcus*) invade and infect the peritoneal membrane and set up acute peritoneal suppuration.

It is now believed that in the presence of infection the lung behaves in an analogous manner. The pneumococcus may be regarded as playing as regards the lung the same rôle that the *Bacillus coli communis* plays in the case of the appendix. But just as every case of appendicitis does not terminate in acute peritoneal suppuration, so every pneumococcal inflammation of the lung does not terminate in acute pleural suppuration.

I do not know what proportion of acute pneumococcal inflammations of the lung terminate in acute pleural suppuration, but the frequency is determined by the resistance of the pulmonary tissue and the virulence of the pneumococcus.

In the course of the influenza epidemic in the United States of America, it was shown by Moschowitz and others that a small ruptured sub-pleural pulmonary abscess was present in every fatal case of empyema coming to autopsy.

There is therefore strong presumptive evidence that acute pleural infection is the result of a small pulmonary sub-pleural abscess perforating into the pleural cavity. Now, it is, of course, obvious that in acute pleural suppuration the focus of infection cannot be extirpated by the radical measures applied to the appendix in acute peritonitis. But actuated by the analogy between pleural and peritoneal infection it is not surprising that many American surgeons at first attempted to deal with the infection of the pleura as soon as the exploring needle and bacteriological examination showed it to be present. The practice was followed by such a terrible mortality

that it was soon abandoned. A man suffering from pneumonia and its attendant toxæmia is not a fit subject for operation. Murphy's aphorism: "There is no treatment of peritonitis" with its implication is inapplicable to acute suppuration pleuritis. Moschowitz says that the treatment resolves itself to the formula *nil nocere* during the early or formative stage of empyema. It is important to recognize that there are three stages in a pleuropneumonic inflammation terminating in acute pleural suppuration:

(i.) Pneumonia is present with pleural exudate chiefly fibrinous and with a small amount of serous fluid. A sub-pleural abscess is in process of formation.

(ii.) Pneumonia is still active with a much larger seropurulent or purulent exudation. The sub-pleural abscess has ruptured.

(iii.) The pneumonia has subsided and the purulent collection in the pleura remains.

In stages (i.) and (ii.) the symptoms are toxæmic.

In stage (iii.) the toxæmia is no longer evident, the symptoms being produced mechanically by the pressure of the purulent exudation on the adjacent lung, the mediastinum and the other lung and the heart.

The collection in the pleural like a collection in the peritoneal cavity may be diffuse, localized or multiple and rarely, of course, it may be bilateral. Encapsulation of the collection to a greater or less extent due to adhesions between the visceral and parietal pleura is always present. In my experience in infants the limitations are less evident.

With regard to the specific organism present in the acute pleural suppuration the pneumococcus is usually the only organism present, but its virulence often becomes attenuated and it may actually die out. Simultaneous or consecutive infections due to the streptococcus or staphylococcus may be present just as in the case of peritoneal suppuration.

Smears are not sufficient for the recognition of the nature of the infection: cultures are essential.

The determination of the presence, the situation and the size of the intra-pleural collection has been effected by those in charge of the patient before I have been asked to operate. I question whether the fullest advantage has always been taken of the more exact information afforded by stereoscopic skiagrams and screening of the chest with the aid of the Potter-Bucky diaphragm. In a hospital at any rate a modern X-ray apparatus capable of giving most excellent skiagrams can be moved from ward to ward and bed to bed. After the crisis the chest should be subjected to a daily scrutiny and if thought necessary, skiagrams should be taken. With the increase of efficiency of the modern X-ray apparatus the working parts have been so simplified and the technique so standardized that it is becoming possible for a medical man to use an X-ray machine with the same facility that he drives his motor car. It cannot be denied that were the physician to combine the ocular evidence of disease in the chest furnished by the X-ray screen with that furnished by his ear and by touch, the presence of acute pleural suppuration would be recognized sooner after the crisis than it is at present. It may be objected that such an examination



would entail too much movement of a patient who is very ill. I cannot see why there should necessarily be much more disturbance of the patient than in the making of his bed and certainly the process would be less trying to the patient than the use of the exploring needle.

In common with others, experience of thoracic surgery in the war led me to consider the methods I was employing in civil practice. Until rather more than two years ago I followed the set practice of removal of a portion of a rib and the insertion of a tube, the removal of which depended on the amount of the discharge provided there were no local or constitutional contra-indications. I was influenced in departing from this practice by the following considerations.

(i.) I had observed in common with other surgeons that it was possible in a case of a penetrating wound of the pleural cavity and lung for the wounds in the parietes and viscus after being subjected to excision, to heal *per primam*. Researches at No. 10 Casualty Clearing Station at Remy Siding during the winter of 1917 showed that a streptococcus could be grown on media inoculated from the surface of almost all wounds after excision and notwithstanding this, the wounds subsequently healed by first intention.

(ii.) I had noticed that the portion of the wound closed by suturing after removal of a portion of a rib and drainage of a pneumococcal empyema healed without suppuration, although the whole wound had been grossly contaminated by the pus in the process of its evacuation.

(iii.) It seemed possible that a pleural abscess of pneumococcal origin might after the evacuation of its contents be capable of healing by first intention in the same way that tuberculous abscesses do when similarly treated.

(iv.) It was thought that possibly the large curdy masses in the pus of a pneumococcal pleural abscess might be an obstacle to speedy healing.

(v.) The war had shown that in penetrating wounds of the chest with or without wound of the lung the collapsed lung would expand rapidly after excision of the infected tissues and primary suture of the wounds.

For over two years I have practised thoracotomy, complete evacuation of pus and curdy masses and primary closure of the wound in pleural abscesses of pneumococcal origin. The incision in nearly all cases has been a muscle splitting one in the direction of the fibres of the *latissimus dorsi* in the mid-scapula line. I have tried a skin incision in the axis of the eighth or ninth rib followed by splitting the *latissimus dorsi*, but the skin of the back is so firmly united to the deep fascia by the fibrous septa of the subcutaneous tissue that I abandoned it.

After the *latissimus dorsi* is split for eight to ten centimetres its edges can easily be retracted as the cellular tissue underlying it is very loose. About eight centimetres of the eighth or ninth rib are then removed in the usual way and a small opening made in the pleura to allow a slow initial escape of the pus.

The incision is enlarged and a ring retractor or rib spreader is placed in position. The patient has hitherto been lying semi-prone.

The incision in the pleura is enlarged to the fullest extent and the patient is turned almost on to his back, so that the side operated upon projects beyond the edge of the table. This allows most of the pus and curdy membrane to run out into a receiver.

He is now placed in the original position and the fullest possible retraction effected, so that the abscess cavity may be gently and effectively sponged dry. All adhesions are treated with respect. I have searched for a ruptured subpleural abscess on the surface of the lung, but have not yet seen one. An aspirating trocar and cannula are next inserted at a spot which will be the most dependent when the patient is supine, the end of the instrument lies just within the abscess cavity.

Interrupted sutures of catgut are passed through the pleura and intercostal muscles and the deeper part of the wound closed. It is very difficult to make this wound airtight, but when the *latissimus dorsi* is sutured, the closure is perfect. The skin edges are next apposed. The aspirator sucks out any blood which may have collected, and creates a negative pressure. The patient is nursed as much in the sitting position as possible.

Although it is generally advised that a bilateral empyema should not be operated upon at one sitting, I felt that evacuation and closure of the pleural abscess on one side will actually put the patient in a better condition for the operation on the other side. I have had only one opportunity for putting this practice into effect. A bilateral collection was treated in the manner described. The operation was done under ether and oxygen and the condition of the patient at no time gave the slightest anxiety.

In the days succeeding the operation aspiration is done when the physical and radiographic signs indicate the necessity.

The first case treated by this method was so successful that it engendered high hopes. One and three-quarter litres of greenish pus containing diplococci in smears were removed at operation. One aspiration was subsequently performed. The wound healed like a clean one. The patient was discharged a fortnight later. Screening and radiograms gave no evidence of fluid.

In the case of bilateral empyema referred to, one side healed without any subsequent discharge of pus. The wound on the other side had to be reopened and a drainage tube inserted.

These two cases are the only examples of the success of the treatment. All the other cases treated by primary closure have eventually had to be drained. The wound in the skin and *latissimus dorsi* almost invariably healed well, but in a week or ten days a fluctuating swelling formed under the incision and called for treatment. One case healed promptly when a piece of thick membrane was removed.

My hopes that after the thorough removal of the contents of a pneumococcal pleural abscess primary healing would result, have therefore been disappointed. It is, of course, impossible through a limited incision to explore thoroughly all the recesses of the abscess cavity and a residual piece of membrane will prevent healing.

In spite of the fact that both simple aspiration and

evacuation with primary suture, will occasionally effect the cure of an acute pleural abscess, my experience of the latter method of treatment is quite against its routine adoption. The comfort of the patient after the operation is undeniable. The discomfort associated with the aspirations to remove any reaccumulation of fluid is also undeniable. In the one of the two cases treated by primary suture in which death occurred, the aspirating needle at its first employment after operation wounded either an intercostal vessel or the lung itself. The abscess cavity filled with blood which reduced the resistance of an already very ill child. Death in the second case took place a few hours after operation. The patient was an infant and a similar result would have followed any operative treatment.

As the bactericidal resources of the patient seldom brings about sterilization of the pleural abscess cavity after evacuation and closure, surgeons have made an endeavour to assist those resources by irrigating the walls of the cavity with "Eusol" or Dakin's fluid and when sterilization is complete, closing the wound by secondary suture. Moschowitz and others have reported very favourable results. I have had no experience of the method in acute pleural suppuration, though I have applied it in a case of chronic empyema with a bronchial fistula.

Where secondary suture after sterilization of a wound in other parts of the body is performed, the surfaces are brought accurately in contact. The wound in the chest wall can be closed in a similar way, but it is impossible to bring the walls of the pleural abscess cavity together in carrying out secondary suture. The usual method of healing of the cavity is by the formation of obliterative adhesions, but the ideal result is healing of the wound in the parietes and expansion of the lung without general adhesion. Moschowitz has no doubt that some cases of secondary suture heal in this way. To secure this result not only must the cavity be rendered sterile, but the lung must be capable of expansion.

The obstacle to sterilization of the walls of an acute pleural abscess may be in the lung, a bronchial fistula being present; a pocket or recess in the cavity to which the sterilizing fluid has not got access in the chest wall, the opening being small or having necrosed.

It will, I am sure, be of great interest to this meeting to learn from those who do not employ costectomy, their experience of simple incision of the chest wall in draining an empyema.

#### EMPHYEMA IN INFANTS AND CHILDREN.

By H. DOUGLAS STEPHENS, M.D., M.S. (Melbourne),  
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EMPHYEMA is the most frequent and with the exception of meningitis the most serious complication of pneumonia in infancy and childhood. In a series of 736 cases of pneumonia occurring at the Children's Hospital, the incidence of empyema was 6.9%; it totalled 50% of all complications. This represents one case of empyema to every fourteen cases of pneumonia. Dunlop, working at the Royal Hospital for Sick Children, Edinburgh, estimated

the proportion much higher, one to every eight or nine. Statistics bearing on the subject in children are admittedly unreliable and difficult to obtain. Some idea of the seriousness of empyema may be gleaned from a comparison of the mortality rates here and in other countries. Covering a period of two and a half years from January, 1921, to June, 1923, 162 patients have been treated at the Children's Hospital, Melbourne, with a total death rate of 24.5%. Brown, at the Children's Hospital, Philadelphia, analysed 259 cases extending over a much longer period from 1906 to 1922, the total death rate being 26.2%. As these figures cover all ages up to fourteen years, it is of interest to carry the comparison further. Our death rate under two years of age was 51.2%; Brown, of Philadelphia, gave theirs as 42%; and Spence in an analysis of 204 patients records the death rate under two years as 55%. With a narrow margin of error it might be stated that one child in four under the age of fourteen years suffering from empyema dies and that death claims one baby in every two affected under the age of two years.

In a disease of such appalling mortality I have thought it desirable in the limited time at my disposal to confine my remarks mainly to the question of treatment. In the 162 cases analysed by me for the purpose of this paper rib resection was carried out in eighty-four, incision alone in twenty-one, aspiration in forty-two and incision and rib resection in fifteen. Some of the deaths must be attributed to want of selection of the proper time at which operative treatment should be undertaken, and to failure to recognise the appropriate type of operation for the individual case. It is probable that all of us have been guilty of subjecting some children very ill with empyema to an operation from which they were quite incapable of recovering and especially has this been so in babies. It is also probable that had we not operated immediately the diagnosis was made, some patients would still be alive. For purposes of this discussion, I think it would be advantageous to consider the subject from three points of view, when to operate, the nature and site of operation and the after treatment.

#### When to Operate.

Considerably over 90% of empyemata in children are due to pneumonia. Pleural exudates in infants under three years are practically always purulent, the serous exudates tending to increase with increasing age. As 98% of our cases were in all probability due to pneumonia, the nature of the surgical treatment is in great measure determined by careful consideration of the relationship existing between the originating pneumonia and the pleural exudate which it causes. If a comprehensive view of the whole subject be taken, it will be apparent that the generality of cases can be classed under three groups: (i.) Those empyemata developing during the active stage of pneumonia and coming under observation at that time, (ii.) those in which the active pneumonic condition has quite recently subsided, (iii.) those empyemata which have been present for weeks or months, the so-called chronic cases.

For purposes of this classification I do not include tuberculous empyemata which are extraordinarily rare in children, not one being recorded in the 162 cases reviewed

by me. Having diagnosed the presence of pus by clinical and radiological means, and by exploratory puncture, the variety of the organism should be ascertained.

In this series in ninety-eight cases the organisms recovered on culture are shown in Table I.

TABLE I.  
BACTERIA RECOVERED FROM EMPYEMA PUS.

Bacterium	PATIENTS		
	Recovered	Died	Total
Pneumococci	58	22	80
Pneumococci, streptococci and staphylococci	3	4	7
Streptococci	3	2	6
Staphylococci	3	2	5
<i>Bacillus coli communis</i>	1	0	1
	68	30	98

One should next endeavour to place the case approximately into one or other of the afore mentioned groups. This is comparatively easy in most cases. The greatest difficulty, however, occasionally arises in determining whether the case should be placed in Group (i.) or Group (ii.), that is, in assessing whether the lung is still actively pneumonic. A child in this stage has a higher respiratory rate; the dyspnoea is often grunting and the respiration of the inverse type; the face is flushed and cyanosis present rather than pallor; delirium is occasionally a feature and the temperature is high and more sustained than when the empyema alone complicates the clinical picture. Cameron and Osman in a recent contribution to the subject have expressed the views which have been developing at this hospital during the past few years. They attribute the high mortality of empyema in the first and second years of life to the specific character of the acute primary pneumonia of infancy, which is more prolonged and severe than the lobar form seen in children over three years and in adults. Infants operated on in the syn-pneumonic stage almost always die, whilst those similarly treated in the meta-pneumonic stage almost always recover.

#### Nature of Operation.

If with some degree of satisfaction it has been possible to place the case in one of the clinical groups already outlined, the nature of the surgical treatment to be undertaken has to be determined. The establishment of a principle which invariably holds good in the treatment of disease, is a difficult if not impossible task and empyema in infancy and childhood offers no exception to this rule. However, for purposes of surgical treatment it would seem to be a good generalization that active interference should be avoided in cases classed under Group (i.). That is to say immediate operation is to be deprecated where pus is found during the active stage of the pneumonia. As a rule pus does not form till well on in the course of

the pneumonia and may be left with discretion till resolution takes place. In some cases pus occurs early and may accumulate rapidly. Here, it is obvious that relief from the accumulating fluid is necessary; aspiration is the treatment indicated and this may be repeated several times if successful. In streptococcal and some pneumococcal infections effective aspiration can be carried on for eight to eleven days, in some cases longer, but usually after two or three aspirations the pus thickens and fibrino-purulent masses collect rendering further aspiration useless. When aspiration fails in the early stages and active pneumonia still exists, the accumulating exudate should be removed by thoracotomy. It is a simple procedure to make a small intercostal incision and thrust in a tube. This can be done with a minimum of shock and, if properly placed and the tube of stout rubber is not compressed by the ribs, as it so often is in very young infants, such a method may give adequate drainage to tide the child over a critical period. A Lloyd's, Pollard's or a Turner's tube is often useful in this type of case. In infants and young children intercostal thoracotomy is to be regarded as a temporary method of drainage in the vast majority of cases and if a comfortable convalescence is to be assured, the better drainage afforded by removal of a rib is often essential. In a limited number of empyemata intercostal incision or even aspiration alone will effect a cure. In the series there were 9% recoveries after intercostal thoracotomy and 8% after aspiration alone. In such cases the collection is generally small, often thin and quite localized. With thin purulent streptococcal fluid such treatment will frequently cure. I do not advocate aspiration more than once or twice even though a few patients are cured by repeated aspirations, because the ultimate expansion of such a lung is impeded by undue thickening of pleura and because of repeated anaesthetics which it necessitates, as well as the pain it creates. If the intercostal incision tides the child over the actively acute period of the disease satisfactorily, it rests with the surgeon to say whether the drainage thus afforded is efficient. Much of a laudatory nature has been written during the last three or four years on the value of intercostal incision, large or small, followed by closure or drainage. It is interesting to note, however, that in few instances has the method of closure been given unequivocal praise when applied to infants and children. I have already indicated that as a temporary measure intercostal incision done perhaps under local anaesthesia, when the child is extremely ill, may save life, but it has often to be followed by other measures, rib resection for choice, to separate adhesions, to free the lung and to maintain more effective drainage. Most often it fails to afford effective drainage for long owing chiefly to its natural tendency to close. The surgeon then has the option of enlarging the intercostal opening or of performing rib resection. The former is thought by many to be the operation of choice if large enough drain tubes can be inserted, because it opens no bone tissue to increase the risk of complications. However this may be, one feels always more satisfied that drainage will be better maintained if a transthoracic thoracotomy is done.

In Group (i.) owing to the greater risk of incurring an open pneumo-thorax if transthoracic thoracotomy is performed, the lesser operation is often done even in patients



who could well stand the major operation. Personally even in these cases provided aspiration has proved futile, my choice lies with the transcostal route, excluding air pressure effects as much as possible for the few days succeeding operation by changing external dressings only. Much success has been claimed by Spence in New York from siphon drainage, which apparently is the routine mode of treatment at the Babies' Hospital. Our experience of the method has not warranted the optimism accorded it by Spence. It has been used here off and on for years past but not recently and has always been discarded on account of defective drainage, generally due to blockage of the tube or because siphon action is nullified by leakage round the tube. Siphon action is maintained according to Spence for six days as a rule, but in few cases did I find it effective for more than two days. In some cases even this short period of efficiency would be of inestimable value in aiding a lung to expand and it seems to me perfection of this method may prove a valuable aid to treatment of the Group (i.) type. Ladd and Cutler, of Boston, consider closed drainage (siphon) useful as a temporary measure in the case of extremely ill patients, but do not recommend it as the operation of choice. It does not supply adequate drainage nor does it allow the operator to free the lung, which can be done in a child through a small opening with one finger. This is a routine procedure in their technique and they assert that it has much to do with their scarcity of chronic cases. They agree with Dowd that "if the lung expands at the time of operation suction is not needed and if it does not, suction will probably not make it."

After examining some of the shrunken, carnified lungs often seen in children dying of empyema, one feels inclined to support Dowd in regard to some cases at least. When operating upon a child acutely ill with empyema, bad effects rarely follow the immediate opening, but, on inserting a finger and breaking down adhesions, the to-and-fro suction action of the chest indicating partial collapse of both lungs causes intense respiratory distress with cyanosis. Evarts Graham has shown that an open pneumothorax produces an increase in intrapleural pressure of the same kind and degree almost in the opposite side as on the affected side, also that a definite quantitative relationship exists between the size of the opening and the danger of death. Therefore, it seems reasonable to make as small an opening for drainage purposes as possible during the acute stage and not to disturb existing adhesions. Later on when adhesions have formed, there is much less risk of mediastinal flutter and in these cases the cause of so-called collapsed lung is less the result of open pneumothorax than of inadequate drainage. In Groups (ii.) and (iii.) the post-pneumonic cases and those commonly classed as chronic, early opportunity should be given for as complete removal of the pus as is possible and for the breaking down of adhesions with drainage of the loculi. In the very long standing cases I question whether it is wise to attempt to separate some of the very thickened adherent surfaces of visceral and parietal pleurae. On two occasions I have thought that a broncho-pulmonary or broncho-cutaneous fistula was induced by this procedure. Intercostal incision in these two groups is not, in my

opinion, the operation of choice and especially so in infants under three years of age.

It does not afford that free drainage which is so essential, and which is the delight of both house-surgeon and nurses who have most to do with the after treatment. It is notorious too how quickly intercostal incisions tend to heal unless kept constantly dilated, a procedure painful to the patient and distasteful to the surgeon. Some measure of success is at times attained by extensive incision and introduction of one or two rubber tubes of large calibre or Turner's tubes or Pollard's tubes, but it is not a comfortable method. Rib resection has proved at this Hospital to be the most satisfactory method of treatment. At least three centimetres of rib should be cleanly removed in infants and much larger portions in older children, if secondary operations for inefficient drainage are to be avoided. If in a child of eight, a piece of rib four centimetres long be removed subperiosteally and the discharge continues for eight weeks, secondary operation to improve drainage will be required on account of almost complete regrowth of the bone, sometimes in ring form. In several patients, chiefly under three years of age, I have removed periosteum as well as bone to insure more lasting drainage, with excellent results. As one patient, however, developed a pneumatocele at the site of operation, it is not to be advocated as a routine procedure. I have divided the periosteum in the middle of the incision vertically as well as longitudinally after securing the intercostal vessels with the idea of obtaining more room. In one of these cases which came to secondary operation I found that the tube had inverted it so much that an internal shelf had formed which impeded drainage, so have discarded this method. I have since found, however, that a similar shelf can be produced where no vertical cut was made. Through the opening made by rib resection effective exploration and removal of fibrino-purulent collections can be carried out, adhesions can be broken down, and the nozzle of the suction pump can be used to empty the cavity completely.

It must not be assumed that all this can be done in every case. Some will not at the time allow of more than rib resection, opening and insertion of drainage tube, but where possible the more complete technique should be carried out. For years I used small bored T-shaped tubes, but have entirely discarded them for wide rubber tubes rarely longer than 3.8 centimetres fenestrated and secured by a safety pin; sometimes two tubes are inserted side by side for a few days. The tube is generally removed in ten to fourteen days, often much earlier, but frequently requires re-insertion for a short period after five or six days. The tube was in position on an average for seven and a half days in my series of seventy-three patients. McGregor, in *The British Journal of Surgery* (July, 1920) advocated a method which he termed the trap-door operation for empyema. He made an incision embracing three sides of a parallelogram, dividing the skin fascia and muscles to the level of the rib and intercostal muscles and reflecting this flap. The rib is removed subperiosteally and the distal part of the flap held in place by loose sutures till the opening into pleura is made. The sutures are tightened and pus escapes under the upper and lower



margin of the flap with expiration; the flap blocks the opening during inspiration. My objections to the operation after carrying it out on four patients (of whom one died) were the extra shock to the young child from the total length of skin incised, the inefficacy of the flap as a valvular mechanism and the ultimate necessity for insertion of drainage tubes.

#### Site of Operation.

Much controversy has arisen from time to time regarding the best site for operation in the usual type of empyema which occupies the lower part of the chest. Should drainage be effected in the most dependent part of the cavity containing the collection or opposite the deepest part? My opinion is that no definite rule can be laid down to apply in all cases, but, in young infants I am distinctly opposed to opening the lowest part of the pleural cavity, for the reason that it encounters the phrenico-costal sinus whose two layers are generally obliterated. On several occasions I have opened the diaphragm in young infants through difficulty experienced in this way. I therefore prefer a higher level for drainage purposes and dorsal rather than ventral to the mid-axillary line. If the empyema can be localized in the axillary region with its deepest part at the sixth rib, the indication undoubtedly is to open at that level as pointed out recently by Fitzwilliams, but radiologically and clinically these cases are not as common as the triangular type of cavity at the base of the lung, resting on the diaphragm. In the latter drainage is applied nearer the lower part of the cavity, due regard being had to what has been said about the obliterated phrenico-costal sinus. Post axillary and scapular line drainage by removal of the eighth rib is the site of election in the great majority of cases at this Hospital. Drainage through the posterior inferior pleural angle, recently emphasized by O'Connor, drains the costo-vertebral gutter and is theoretically excellent. The thickness of the overlying muscle and its intimate attachment to the ribs in this region, increased hæmorrhage and a predisposition to early closure from muscular action were factors which prejudiced me against employing it as a routine in basal empyemata in infants. Large intercostal incision with immediate closure and subsequent aspiration has not been successful in the series under review. I have vivid recollection of several done 2 years ago, with results so unsatisfactory as to condemn this method effectively.

#### After-Treatment.

As to the use of the Carrel-Dakin technique in empyemata of infancy and childhood, brief comment only is possible. I have used the Carrel-Dakin method very little in acute cases and have not been favourably impressed. In very young children in the acute stage it has proved very irritating and is not tolerated at all well. In older children and when the patients have what may be classed as chronic cavities it has proved of much use, though strict supervision should be exercised over the process of manufacture of the solution. Dr. Boyd Graham assures me that the fluid made according to Dunfresne's method is non-irritating in chronic conditions, but with other methods of preparation it is very irritating and seems to exercise

a caustic action owing to whatever chemical reaction predominates, whether acid or alkaline. It does seem to have a solvent action on comparatively recent fibrinous collections and adhesions and renders the discharge more limpid, but is useless in very chronic cavities, except as a sterilizing medium. "Flavine" is useful, though from experience with one patient who developed a severe and persistent nephritis, I should not use it where the absorptive surface is large. I have practically discontinued vaccine treatment in chronic and discharging empyemata for some time past, not that any injurious results occurred, but because no good seemed to follow. Delbez, in December, 1920, advocated vaccine treatment and recorded the case of a child under two years with extensive staphylococcal empyema who recovered completely after eight injections of staphylococcal vaccines in sixty days. Well developed children with good chest formation generally do well, especially if their nutrition is maintained by high caloric feedings, cod liver oil and the like to repair the rapid nitrogenous waste. Dressings should be antiseptic, infrequent and with as little exposure of the wound to the air as possible. Early blowing exercises and early walking when possible are valuable adjuncts to success. Weather permitting, children with empyema do infinitely better when treated out of doors in the sunlight. Dr. Grieve has recently examined a number of infants and children upon whom operative treatment had been carried out from one to four years ago. He was astonished at the comparative absence of scoliosis and the excellence of the vesicular murmur, even in patients in whom there was pulmonary collapse and scoliosis was present on discharge. In respect to anæsthesia local infiltration was used in a number of patients, generally when intercostal incision only was contemplated or in patients who were too ill to stand a general anæsthetic. The usual general anæsthetic was chloroform or ethyl chloride induction followed by ether on the mask or ether throughout. Gas and oxygen were not used. In a number of cases I have utilized the intra-tracheal and intra-pharyngeal methods of administration, but am bound to confess disappointment in that the lung did not expand any better than with the ordinary mask method. Matas and Lilianthal strongly commend the positive pressure ventilation of the lung by either maso-pharyngeal or intra-tracheal catheterization and Lilianthal prefers the former as the simplest and safest.

Whether the incidence of empyema will be much effected in the future by the use of an effective serum still remains doubtful. Some gleam of hope is thrown out in recent results obtained by Dr. Webster at the Children's Hospital using Type I. serum, but although optimistic, his statistics are too few to admit of any definite conclusion on the point. It has been shown by research workers at the Rockefeller Institute that appropriate serum appears to have the effect of inducing an earlier crisis, but it is doubtful whether resolution of the actual pneumonia is precipitated. If a serum were capable of inducing earlier resolution, this in itself would be of immense help in the treatment of empyema, for it would transfer many cases from the Group (i.) series to Group (ii.) and (iii.), in which operation is safer and, if able to be done earlier, would predispose to better expansion of the lung.

MR. R. HAMILTON RUSSELL said that there had been a good deal of coquetting with the idea that drainage could be avoided in empyema. This was unsound practice. Drainage and nothing but drainage should be regarded as the standard method of treatment. He did not mean to say that exceptional patients might not recover with the assistance of repeated aspiration, but aspiration should be a subsidiary or adjuvant method of treatment only. He would make the suggestion to Mr. Newland that instead of immediate closure, drainage should be instituted for a few days after which the wound might be closed. Everyone had noticed that there was profuse discharge in the first twenty-four hours; in the second twenty-four hours there was very much less and by the third day the amount of the discharge was very small.

It was a pity to enclose this material within the chest. The principle he had adopted was to remove at least 7.5 to 10 centimetres of rib and to evacuate the pus and masses of fibrin. He did not insert a tube, but simply applied antiseptic dressings. Determination of the extent of the operation was not to be made until the finger was in the pleural cavity and the incision might then be enlarged according to the lie of the cavity and the relation of the opening to it. He used no sutures and considered sutures a great cause of sepsis. He used to place a piece of rubber dam over the whole of the wound area to act as a valve, but he had noticed that some young infants became suddenly ill, the wound became covered with grey stinking sloughs which looked like hospital gangrene and the young patients died. He had therefore given up the use of the rubber dam and at each change of dressing placed gauze soaked in a 1 in 40 carbolic acid solution over the wound. The surrounding skin was washed with the same solution.

MR. BALCOMBE QUICK emphasized the value of radiology in dealing with empyema. Experience of thoracic surgery during the war and in influenzal empyemata had shown that the dictum that: "Where the pus is, there follows the scalpel," did not always hold. Wide opening of the thoracic cavity before adhesions and fixation of the thoracic contents had occurred might result in "flopping mediastinum" which might kill the patient. At a later stage when adhesions had formed and the pleura had become thickened, "flopping" did not take place. He regarded local anaesthesia as of the greatest importance in this connexion. Most surgeons could recall at least one fatality under the operation with general anaesthesia. Local anaesthesia could be used quite safely and without pain even in the youngest children.

Of paramount importance was the site and size of the opening. The site should be on or about the ninth rib and the size of the drainage opening should be proportional to the size of the glottic aperture. If the opening were larger than the glottic aperture the mediastinum might flop, but if the opening were smaller, there was a constant tendency for the lung to re-expand.

DR. W. T. HAYWARD said that he had listened to the discussion with a great deal of interest. The principles underlying the method described by Mr. Russell had been used by him for many years and the results of such treatment had been published in the *Australasian Medical Gazette* in 1898 and had also been submitted to the Hobart meeting of Australasian Medical Congress in 1902.

DR. H. GILBERT gave a brief résumé of his personal experience at the Adelaide Children's Hospital during a period of nine years of the treatment of empyema. He had operated thirty-nine times on thirty-six individuals with an age incidence ranging from six months to ten

years. In two instances pus recurred in the side previously operated at intervals of six and twelve months respectively. In one patient an abscess had formed at the site of the scar and had failed to heal. It had been found to be connected with a fresh accumulation of pus in the pleural cavity. In the other a second attack of pneumonia preceded the recurrence of empyema. The condition had proved to be tuberculous in only one patient; in all the others it had followed a definite pneumonia.

The deaths totalled five. At autopsy on a baby of six months it was found that the right lung was tuberculous and that the empyema was secondary to rupture of a tuberculous abscess. One in a child of two and a half years death had been caused by a complicating diphtheria. In the other three patients who were all under two and a half years, death had apparently been due to the low recuperative powers of the young patients. All had been under observation from the onset of the pneumonia and had been operated upon as soon as pus was detected.

All the others had recovered, including the two patients in whom recurrence occurred. In only one patient had double empyema been encountered. The second operation had been undertaken four days after the first.

Originally Dr. Gilbert had been a strong advocate of rib resection. Chiefly as the result of the influence of Dr. H. Swift, he had come to favour simple incision as being the simpler and sounder proceeding in all but exceptional cases.

Resection had been performed in his first twelve patients; in the last twelve resection had only been performed twice. Ample room could usually be obtained by simple incision for the removal of fibrinous masses and for the purpose of reaching and breaking down any adhesions. No trouble had occurred from hæmorrhage; the procedure was undoubtedly quicker.

The only disadvantage of simple incision was that owing to the valve-like nature of the wound it was necessary to retain the tube for a few days longer than after resection.

In some patients in whom there had been much tension, aspiration had been performed prior to operation.

General anaesthesia with the "Kelene" ether sequence or ether alone both by the open method was induced with the patient lying on the sound side, so that everything was ready for operation as soon as the anaesthesia was deep enough. The administration was not started until he had finished his preparation.

In no case did the use of general anaesthesia cause any undue anxiety and operation was entirely unhampered by the struggles and terror of a nervous child under local anaesthesia. The earliest death, with the exception of that of a tuberculous subject which occurred on the third day, took place six days subsequent to operation in a baby six months old. It could be assumed that the use of general anaesthesia could not be held responsible for the fatality.

Of fifteen text books consulted on the question of resection *versus* incision, twelve were for resection, two for incision and one was indifferent, but it appeared that the majority of the authors in favour of resection either claimed or assumed that it was impossible to establish adequate drainage by incision. He was convinced from his own experience that in the majority of cases adequate treatment was achieved by incision.

In the management of the after treatment blowing water from one bottle to another was extremely valuable. Two objections have been made to it: it might cause emphysema without producing proper lung expansion; it was no better

than deep breathing exercises. He had not so far met with emphysema. All his patients had reported some weeks after leaving hospital and no abnormality other than occasional slight impairment of movement had been detected. In regard to the second point while he admitted that the repetition of a positive pressure might not do all that was claimed for it, the method necessarily entailed repeated deep inspiration, thereby establishing a system of breathing exercises which were attractive and easy to teach to a young child.

#### FLOATING CAECUM AS A DEFINITE PATHOLOGICAL ENTITY.

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In practice one is constantly faced with abdominal cases to which it is not only difficult to give a name, but from the symptoms as described by the patient one can only hazard a guess at the pathological condition causing them. The number of appendices removed without apparent benefit indicate this difficulty.

In many no doubt several parts of the intestinal canal contribute their quota to the pains and discomforts, reacting one upon the other.

In spite of the immense amount of X-ray study, physiological experiment and observation at operation we know little enough about the control of the intestines both in peristalsis and dilatation. The stomach shows irregular contractions. Our X-ray colleagues tell us there is probably a duodenal ulcer or a chronic appendicitis; spots many feet apart. Why?

We surgeons have watched the sometimes surprising results of our excisions, anastomoses, colostomies, often surprising because of the small disturbance caused by the most radical interferences with the normal morphology. Yet we cannot tell any patient with certainty why he has pains and his neighbour on the same diet has none; some have diarrhoea, borborygmi, constipation and other unpleasantnesses in spite of dietetic treatment.

I am confining my remarks to one part only of the digestive tract. I have grown to feel that the caecum is sometimes the offender and causes a condition peculiarly its own.

Humbly I admit that I know little about it, but I hope that others present may help me and from inferences drawn from their own experience we may formulate a reasonable scheme, not only of treatment but also of definition.

Many excellent papers have of late years been published describing physiological experiments and various treatments from paraffin oil and ingenious belts to operative fixations and excisions.

Sir Arbuthnot Lane was perhaps the first to impress the surgical world with the possibilities of almost total colectomy. I remember a short poem in the *Guy's Hospital* magazine describing one of this great surgeon's operations. The last lines were:

The lesser part went back to bed,  
The rest was an excision.

A man's clear vision may be blurred by the mist of some remarkable success and even Lane in later life sometimes blended justice with mercy. I have known him in one afternoon to send two patients, who unknown to him were chums travelling the world together, for steel spring belts and paraffin.

I need not cite these papers. Many of you will have read most of them. I have personally gained much to think about out of them, but they have left me with the feeling that they are dealing with the last stages of some condition which they do not recognize.

We all know the picture of the last stage of colon stasis. The muddy-faced, depressed woman, occasionally man, with flabby abdomen, either with constipation or with interval periods of diarrhoea, perhaps with suicidal tendency, always taking medicine, having had much treatment, possibly with a scar in the upper part of her abdomen where it had been opened for exploration during an exacerbation. She may even have had a gastro-enterostomy, but she tells you that she was no better for the operation. She is a burden to herself and to her family, not too ill to make herself prominent in the house, but not well enough to be a pleasant companion. She is obviously suffering from toxæmia.

I shall later consider whether we can do anything for her; but let us now consider what is the beginning of this condition, for surely it ought to be treated at its onset.

There is the young person with recurring pain in his right iliac region. When his appendix is removed, as sooner or later it is sure to be, we may find it very long, very short, a bit kinked or bound to the outer side of the caecum, but with no real signs of past inflammation. If we do nothing beyond removal, we are likely to find that the symptoms continue. But we may have noticed that the caecum was very long, hung over the brim of the pelvis and with the whole or greater part of the ascending colon supplied with a mesentery.

I am of the opinion that this is a congenital abnormality and its possessor may gradually, if left alone, in later years develop into the poor miserable creature above described.

Embryologically the normally situated caecum is in its third position. In the second, about the fourth month, it is near the right kidney and here in carnivora it remains. Can you imagine the beautiful lithe form of a tiger to contain a distended caecum in that narrow waist?

As in all organs developed late, especially those least required under modern conditions, the caecum like the appendix is most variable. Much evidence has shown that these variations are often hereditary.

In young children we often find the caecum in the pelvis and we have removed gangrenous appendices adherent to the rectum or bladder. In many cases the mesentery apparently shortens later, possibly a reaction to the constant drag.

If we continued on all fours probably the condition would be harmless. The standing position is not normally continued for long in man. Natives all the world over squat on all possible occasions, supporting their lower abdomens by their flexed knees and only utilize our much



boasted erect position when in motion with their muscles braced to action. If we keep our abdominal muscles in good trim, we can probably, helped by the natural tone of the intestinal muscle itself, prevent a long caecum from becoming a stagnant stinking pool.

My view is that in some cases a vicious circle is set up. In a period of illness from some other cause the musculature of a long loose caecum is debilitated. Stasis and gas formation occur. The increasing weight of the contents dilate it still further. On recovery from the intercurrent illness this stretched musculature does not recover its tone. Then the lining and its glands alter. The wall becomes gradually infiltrated with fibrous tissue and the condition becomes permanent.

At operation one handles a long, pendulous, heavy, dead-feeling piece of gut which fills a large part of the abdominal cavity. It gives a nasty, unpleasant, uncleanly impression.

Before discussing treatment I must for a moment consider what value the caecum is to the human economy.

That antiperistalsis is a common, almost regular occurrence in the colon is well known, but whether it occurs under absolutely normal healthy conditions is not known. A bowel containing heavy bismuth is not in a normal state.

We know, however, with certainty that a long blind end left by operation will be filled by it to a bursting point. This antiperistalsis is probably a big factor in overfilling a long flabby caecum.

It has been proved that only a slight amount of digestion and that chiefly of fats takes place in the caecum and that the liability to stasis and the manufacture of toxins far outweighs its utility. Some absorption of fluid takes place there, but patients without the right half of the colon pass formed stools. The last part of the ileum which embryologically resembles the colon, has been shown to develop in these patients. We need not therefore be very nervous about sacrificing the part.

In the advanced cases in my hands hemicolectomy has given the best results and, indeed, I could show one or two quite remarkable improvements. I maintain, however, that it is the wrong end of the disease to be called upon to treat.

If I am right and I stand before you for judgement

and expect no mercy, this disease of the caecum and ascending colon is an entity in itself and should be taught as such as much as, shall we say scoliosis or any other deformity man is heir to.

We do not wait until the vertebræ have been hopelessly deformed before we treat scoliosis, neither should we wait until the natural power and mucous membrane of the caecum have been destroyed before we treat this disease. I like the name scoliosis. Hardly any student knows its derivation, but it always brings a definite picture to their minds. I wish this disease which I have been trying to describe had an equally good one. I would suggest the term, "floating caecum."

I believe that certain unfortunates would be saved miserable lives.

I have left the question of early treatment to the last. At present it is tentative. I hold that there are always warnings. I believe that plication of the caecum in order to prevent the collection of gas and at the same time its attachment to the wall of the iliac fossa, very simple procedures will prove to give good results.

The actual operation which I perform, is done through a high muscle splitting opening, the lower end being on a level with the anterior superior spine, thus insuring that the external oblique is muscular.

I infold the sacculations between the longitudinal bands, uniting these with separate sutures leaving five of the sutures long.

A fold of peritoneum in the iliac fossa is picked up and incised along its base. This fold is applied to the outer side of the caecum, the lower three long sutures being used. A small bare area is thus left in contact with the postero-external surface of that organ. The upper two long sutures threaded on long handled needles are pushed through the wall of the flank. Two small skin incisions are made on to the points of the needles and the sutures are attached to the external aponeurosis, thus fixing the ascending colon.

I remove the appendix for fear of kinking it, but do not believe it has been the cause of the pains for which I have operated.

For the last few years whenever I have met these loose caeca, no matter for what I happen to be operating, I have carried out this procedure.